THE IRON TRADE REVIEW

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REAL STENGTH

IS SHOWN BY LARGE INCREASE IN SPECIFICATIONS.

Structural Mills Busy, but Some are Soliciting Orders—Pig Iron Market Quiet but Prices Well Maintained—Scrap Weak.

While the demand for pig iron and some finished products is not as active as it was a few weeks ago, evidence of much strength in the market is not lacking. In estimating the real strength of the situation, consideration of the heavy specifications, which have been received, is important, for it is understood in the trade that mere orders are often misleading, on account of the well known disposition of buyers not to specify on contracts when there is a slackening of demand. The specifications for steel products in western mills, for the past seven weeks, have been 18 per cent above the average weekly specifications for 1905, and orders at these mills now amount to about 350,000 tons for rolling at the earliest date possible. This statement includes only about a two months' output of steel rails, as the South Chicago mill has its product for almost the entire year sold.

Looking For Business. While the general report from structural mills is that they are not catching up on their orders, one important independent interest, which has refused to take orders during the winter, is able to give prompt shipment, and is again soliciting business. Considerably better delivery is being given on plates, but sheet mills, whose customers usually demand very prompt delivery, are still running behind in filling their orders.

The Pig Iron Situation. The United States Steel Corporation, having decided not to exercise its option on 5,000 tons of Bessemer pig iron for first quarter delivery, that tonnage will be available for other buyers, who will, no doubt, promptly avail themselves of the opportunity. Basic pig iron shows increased strength. Some heavy orders are pending on southern iron. The market for prompt shipment has been much stronger than for future delivery, due, to a large extent, to the fact that the increased freight rate of 25 cents per ton becomes effective March 1. While as high as $14.50 Birmingham for No. 2 has been paid for spot iron, $14.00 is the basis for future delivery, but this basis is not strictly adhered to for low grades. The inquiry for 15,000 tons of northern and southern iron, pending last week in the Chicago district, has been withdrawn, on account of satisfactory quotations not being made.

Ferro is Not So Strong. Keen interest is manifested in the ferro-manganese market. Although the quotation for spot shipment is still very high, rumors that important interests would soon appear as sellers have had the effect of weakening the market for future delivery, and it is understood that sales have been made at less than $90.00.

Strike is Not Feared. Coke is slightly stronger. If the threatened strike should be declared, prices will probably be somewhat higher, but it is not expected that the miners in the Connellsville district will strike, as they are not organized or dissatisfied.

New Record for Ore. The complete report of shipments of ore from the Lake Superior ranges by mines shows that 34,353,456 tons were shipped, an increase of 24 per cent over the record year of 1902. The shipments, last year, were within a million and a half tons of the entire tonnage of the mines in the forty-seven years prior to 1888. The all rail shipments show a large increase, due partly to the shipments made to Colorado.

STEEL CARS GAINING.

Record Orders Shown By Report of Pressed Steel Car Co.

The annual meeting of the Pressed Steel Car Co. held Wednesday, Feb. 21, at Jersey City, N. J., brought out some interesting facts in connection with the steel car industry of the country for the past few years. The report shows that during 1905 the company built 18,837 cars as against 5,000 in 1904. During this year it also built 2,061 underframe cars.

In the year 1905 the railroads of the United States ordered more cars than ever before in their history. The last annual report of the company stated that the average annual requirements of the United States were about 195,000 cars, but during the years 1903 and 1904 only 240,000 cars were ordered in that year, indicating that the railroads not only covered their estimated annual requirements but also added thereto the cars they had failed to purchase during the previous two years.

"It is gratifying," says the report, "to note the continued tendency to substitute steel for wood in all freight car construction. Of the cars ordered during 1905, almost 50 per cent were of steel or steel underframe construction, and the extraordinary demand for this class of rolling stock proves that it is rapidly becoming standard for railroad equipment. It is with satisfaction that we are able to state that the experience of users of steel cars strongly inclines toward the pressed steel type over the structural."

The company's gross sales for 1905 were $19,357,826.88. Of this, 60 per cent was done during the last five months of the year. On this the net profits were $1,106,901.51.

The company has decided upon large improvements, many of which are now under way. They consist of a steel car plant at McKees Rocks and several additions to its plant at Allegheny. The Pressed Steel Car Co. has its works at Allegheny and McKees Rocks, Pa. It employs in its shops upwards of 8,000 men, and will have a capacity of 150 freight cars a day, of all steel, or steel and wood composit cars. Its new steel passenger car shop is practically completed, having a capacity of 750 steam and street railway cars per year.

THE WEEK IN IRON CENTERS.

PITTSBURG.

Heavy Demand for Finished Products. —Pig Iron Quiet but Firm.

OFFICE OF *The Iron Trade Review*, }
521 PARK BUILDING, February 20 }

The extremely heavy demand for finished products and the quiet, steady strength of the pig iron market have been the leading features in this market during the past week. New business in the finished lines has been particularly heavy in structural material while in other lines the heavy and persistent demand for delivery on specifications against old contracts is increasing rather than declining and mills are being rushed to their utmost capacity in order to satisfy, in a measure at least, the clamor which exists. For some time past producers have felt that the new business could not keep up at the top-notch gait at which it has been coming in and were looking ahead to the time when the shipments from the mills would at least keep pace with the new orders booked and this is now true in plates, sheets and tin plate, although in the two latter lines mills are running practically to capacity to satisfy customers on their specifications against old contracts and this will be true for some time to come. The tremendous building movement which is on in all parts of the country has sorely taxed the structural mills and, if anything, they are getting still further behind in their deliveries. As a general condition the plate mills are running about even, comparing new business with tonnage output shipped on contracts.

The feeling in regard to the imminence of a coal strike is to some extent divided although the impression prevails that unless the miners recede from the position they have taken a struggle is absolutely sure to follow, as the operators are prepared and, according to good advice, even anxious to try conclusions. In many directions preparations are being made to fortify against a strike and immense stocks are being laid in at several large mills. Where storage space is not available, it is being leased. At the present time it is known, however, that one or two big interests have supplies sufficient for only two or three weeks ahead and a conflict between operators and miners would bring about serious results.

Pig Iron.—The United States Steel Corporation late last week released its option on 5,000 tons of Bessemer pig iron, thus putting this much more within reach of the market for first quarter delivery. Bessemer pig iron for this delivery is extremely scarce although several small lots have been sold during the week. Furnaces are practically sold up for February and March shipment and aside from odd lots, what remains is in the hands of middlemen. On small lots for prompt shipment $17.75 is the market, although some might be obtained at $17.50. Basic pig iron, which for some time has been comparatively weak, is quoted $17 to $17.25, although some has been sold at a less figure. There are several good inquiries out for round tonnages, and between 4,000 and 5,000 tons has been sold at higher than $17. valley furnace. Northern No. 2 foundry iron is quoted $17.25 to $17.50 while southern foundry is being held at $14, Birmingham. Southern gray forge is none too strong at $12.50, Birmingham, and during the week under review 2,000 tons was sold to Pittsburg interests at a considerably lower price, part of it being a conversion deal. We quote:

Bessemer Valley	$17.50 to 17.75
Bessemer, Pittsburg	18.35 to 18.60
No. 1 Foundry, Pittsburg	18.50 to 19.00
No. 2 Foundry, Pittsburg	18.10 to 18.35
Gray Forge, Pittsburg	17.35 to 17.60
Basic, Valley	17.00 to 17.25
Basic, Pittsburg	17.85 to 18.10

Ferro-Manganese.—This market has been considerably shaken by reports of contemplated action on the part of two big interests and there is considerable speculation as to what the ultimate result will be. Within the past few days small lots for ferro-manganese, foreign 80 per cent, has been sold for spot shipment at $140, $150 and $165 although quotations for forward delivery are around the $100 mark and some much lower than this figure.

Billets.—Some billets have been offered during the week and it is reported that one lot, not standard, was offered at $26.50. Bessemer billets are quoted $27.50 and open hearth at $28.50 for prompt delivery. One small lot of small billets was sold as high as $33, Pittsburg.

Skelp.—There has been but small dealing in skelp, as mills are pretty well filled up on old business and new business is light, consumers having covered on contracts some time back for their requirements. We quote:

Bessemer grooved, 1.65c to 1.70c; sheared, 1.70c to 1.75c; basic, grooved, 1.65c to 1.70c; sheared, 1.70c to 1.75c; iron skelp, grooved, 1.65c to 1.70c; sheared, 1.80c.

Muck Bar.—An offering of a good tonnage at less than $30 has gone without a taker. No sales of size worthy of mention have been made and the market is nominal.

Rods.—Makers are now utilizing their rods for the manufacture of finished wire products and the big producers have withdrawn quotations and are not selling except as accommodation to old customers.

Merchant Bars.—This market is still weak and the demand for iron bars on new contracts has fallen off to such an extent that but little new business has been reported. This weakness is confined to common iron bars and does not apply to the finer grade of refined iron bars. The demand for delivery on specifications against old contracts is strong. We quote:

Common iron bars, 1.85c to 1.90c in carload lots, 1.95c in less than carloads; Bessemer steel bars, 1.50c; open-hearth steel bars, 1.50c; plow and cultivator, 1.50c net; channels, angles, zees and tees, under 3 inches, 1.60c, all f. o. b. Pittsburg. The following differentials are maintained on steel: Less than 2,000 pounds .10c advance, less than 1,000 pounds, of a size, .30c advance.

Hoops and Bands.—New tonnage is good and the mills are well filled up with contracts on which buyers are specifying freely. We continue to quote: Hoops, 1.90c in carload lots, and 2c on less than carload lots, Bands, 1.50c base, half extras as per standard steel card. Prices f. o. b. Pittsburg.

Merchant Steel.—While in most instances quotations are being firmly adhered to, some producers are demanding a premium for prompt delivery. Mills are running full, mostly on old contracts, but new business is being received at a satisfactory rate. Although the large trade is pretty well covered the demand is fairly good. We quote:

Cold rolled and ground shafting, 50 per cent off in carload lots, and 45 off in less than carloads, delivered in base territory; tire steel, 1.70c to 1.80c; open-hearth spring steel, 2.25c to 2.50c; sleigh shoe flat, 1.50c to 1.55c; smooth finished machinery steel, 1.90c to 2c; toe calk, 2.05c to 2.10c. The price of planished and machine straightened tire is 1.70c base half extras as below. Iron finished tire up to 1½ inch by ½ inch 1.65c base half extra tire list. Iron finished tire 1½ inch by ½ inch and over to be sold on regular bar basis of 1.50c base, half extra steel card.

Rails and Track Material.—There has been considerable business in both light and standard sections although the former is much better than the latter, the demand being excellent and prices well maintained. During the week local producers have closed for

about 14,000 tons of heavy sections, 5,000 tons of which went to the Wabash railroad. We continue to quote:

Fifty pounds and heavier, 500-ton lots and over, $28; carloads and less than 500 tons, $30; less than carload lots, $32; light rails, 16 pounds, $30; 20 pounds, $28.50 to $29; 25 to 45 pounds, $28; angle bars for standard sections, 1.50c; spikes, $2.05 to $2.10.

Merchant Pipe.—The demand continues about the same as it has for some time past and the mills are booked for a considerable time ahead. There has been no change in prices and we quote pipe, consumers' carloads as follows, with jobbers' carloads one point higher discount:

	Steel		Iron	
Consumer's Carloads	Black	Galv.	Black	Galv.
⅛ and ¼ inch	71	55	67¾	51¾
⅜ inch	73	59	69¾	55¾
½ inch	75	63	71¾	59¾
¾ to 6 inches	79	69	76	66
7 to 12 inches	74	59	71	55¾
EXTRA STRONG PLAIN ENDS.				
⅜ to ¾ inch	64	52	60½	48½
½ to 4 inches	71	59	67½	55½
4½ to 8 inches	67	55	63½	51½
Double extra strong plain ends, ½ to 8 inches	60	49	56½	45½

Boiler Tubes.—On merchant boiler tubes, 22 feet and under, consumers' carloads we quote as follows:

MERCHANT BOILER TUBES, CARLOADS, 22 FEET AND UNDER.

	Steel	Iron
1 to 1¼ inches	46	41
1¼ to 2¼ inches	58	41
2½ inches	60	46
2¾ to 5 inches	66	53
6 to 13 inches	58	41

Less than carload lots two points less.
2½ inches and smaller, over 18 feet, 10 per cent net extra.
2¾ inches and larger, over 22 feet, 10 per cent net extra.

Structural Material.—Notice has been received that on March 8 the New York Central lines will receive bids for the construction of the new tunnel under the Detroit river, at Detroit. This tunnel will be over two miles long and bidders have several options upon which to figure. While the major part of the tunnel will be a cast iron proposition, reinforced concrete and plate, channel and beam types will receive consideration and all might enter into the construction of the tunnel. At least 5,000 tons of structural material, it is estimated, will be used in that part directly under the river. Instead of gaining on the new business, structural mills are running behind on their deliveries, the immense building projects under way in all parts of the country are making it impossible for mills to gain on new business or improve deliveries. We quote:

Beams and channels, 15 in., and under, 1.70c; over 15 in., 1.80c; zees, 1.70c; tees, 1.75c; angles from 3 to 6 inches, inclusive, 1.70c; over six inches, 1.80c; universal and sheared plates, 6¼ inches, and wider, 1.60c base.

Plates.—Among the finished lines, plate is about the only product upon which conditions surrounding delivery have shown any improvement and in some instances mills are promising delivery within two to three weeks of the time orders are placed. We quote:

Tank plate ¼ inch thick, 6¼ to 100 inches, 1.60c f. o. b. mill, Pittsburg. Extras are as follows per 100 pounds, boiler and flange steel plates, .10c; A. B. M. A. and ordinary firebox steel plates, .20c; still bottom steel, .30c; marine steel, .40c; locomotive firebox steel, .50c; all sketches excepting straight taper plates, varying not more than 4 inches, in width at ends, narrowest end not being less than 30 inches, .10c; complete circles, .20c. Plates in width over 100 inches up to 110 inches, .05c; over 110 inches up to 115 inches, .10c; over 115 inches up to 120 inches, .15c; over 120 inches up to 125 inches, .25c; over 125 inches, up to 130 inches, .50c; over 130 inches, 1.00c. Gauges under ¼ inch to and including 3-16 inch plates on thin edges, .10c; under 3-16 inch to and including No. 8, .15c; under No. 8 to and including No. 9, .25c. Five cents extra for less than carloads. Terms net cash in 30 days.

Sheets.—The demand for sheets, both black and galvanized, is now confined almost entirely to specifications against old contracts and these demands are very insistent and pressing. Consumers and jobbers covered for practically all requirements prior to the latest advance and are now turning their energies toward securing delivery. The supply of semi-finished steel has improved and mills are running practically to capacity in order to take care of the business and have been unable to lay in stocks as is customary at this time of the year. We quote as follows:

Black steel sheets, box annealed, cold rolled, one pass: Nos. 11-12, 2c; Nos. 13-14, 2.05c; Nos. 15-16, 2.10c; Nos. 17-21, 2.15c; Nos. 22-24, 2.20c; Nos. 25-26, 2.25c; No. 27, 2.30c; No. 28, 2.40c. Galvanized, Nos. 10-11, 2.35c; Nos. 12-14, 2.45c; Nos. 15-16, 2.55c; Nos. 17-21, 2.70c; Nos. 22-24, 2.85c; Nos. 25-26, 3.05c; No. 27, 3.25c; No. 28, 3.45c. Corrugated roofings, 1.70c per square for No. 28 painted, 2½-inch corrugation; 3.05c per square for No. 28 galvanized, 2½-inch corrugation. Quotations f. o. b. Pittsburg on large lots.

Tin Plate.—As is the case with sheets, mills are filled for some time ahead on old contracts and are busy trying to comply with demands of the trade on specifications, although new business is good.

We quote: $3.50 per base box, f. o. b. Pittsburg, 14 x 20 100-pound cokes, terms 30 days, less two per cent off for cash in 10 days. Some mills allow a 5c per box rebate on this price to the large trade.

Wire and Wire Nails.—Wire and wire products are very strong, at prices which have been in effect for several weeks. The advance anticipated about Feb. 1 has not materialized, although conditions apparently warrant an increase should producers be inclined to make it. Mills are out of the market to all intents and purposes on rods and are using this product in the manufacture of their finished lines. We quote as follows:

Wire nails, jobbers' carload lots, $1.85; retailers' carload lots, $1.90, and less than carload lots, $2; painted barb wire, $2 for jobbers in carloads; retailers in carloads, $2.05, and less than carloads, $2.15, with 30c for galvanizing; plain wire $1.70 to jobbers and $1.75 by carload.

Old Material.—The weakness of the past few weeks still prevails in scrap and the indications do not point to a speedy improvement, although conditions do not seem to warrant the present slump. There is plenty of scrap in the market, but consumers have shown no inclination to buy at the ruling prices. Speculation during the winter is largely blamed for the conditions now. We quote:

Heavy melting stock, $15.75 to $16; old steel rails, long lengths, $17 to $17.50; No. 1 cast scrap, $15.50 to $15.75; cast scrap borings, $9.75 to $10.00; bundled sheet scrap, $14.00 to $14.50; No. 1 railroad wrought scrap, $18.50 to $19; No. 1 yard faggoting scrap, $17.50 to $18.25; low phosphorus scrap, $20.50 to $21.50; wrought turnings, $13.00 to $13.25; busheling scrap, $14.75 to $15.25; iron axles, $26.50 to $27.00.

Coke.—The coke situation is a little stronger than it has been for the past two weeks and considerable business has been done. Two or three of the higher grades of foundry coke are quoted $3 to $3.25 but standard Connellsville has been sold at $2.75 to $3 and furnace $2.35 to $2.50. The strike of miners along the route of the Buffalo, Rochester & Pittsburg railroad ten days ago resulted in the placing of considerable coke tonnage with Connellsville ovens, but much of this has now been canceled since the strike was declared off. It served, however, in relieving the Connellsville district of practically all surplus coke. The bituminous coal strike will help coke prices if it materializes but no fear is felt that it will spread to the Connellsville district as there is no miners' organization there and has not been for several years. The estimated output of the Connellsville region for the week ending Feb. 10 was 282,869 tons as compared with 283,069 the previous week. In the lower Connellsville region the estimated output for the week ending Feb. 10 was 97,729, a gain of about 2,000 tons over the previous week.

CHICAGO.

Specifications for Steel Products Heavy.—Prices of Pig Firmer.

Office of *The Iron Trade Review*,
1164 Monadnock Block, February 20

Little news of a positive character has developed this week. Old material, pig iron and bar iron are the only branches of the trade that show continued weakness. In the case of scrap, the cause is evidently the large stocks which have accumulated, partly because of the open winter, and partly because the dealers preferred last year to stock up rather than to sell promptly, consumers at the same time having been able to provide for their anticipated wants considerably in advance. The development of the foundry trade in this locality has not proceeded with the same rapidity as steel, and while prices have generally been sustained, it has been accomplished at the expense of trading. Two entirely opposite conclusions may be drawn from local conditions—one of inherent strength, and the other that the market has a fictitious and artificial support.

The rapid manner in which steel consumption has been increasing is shown by the fact that specifications for steel products at western mills for the past seven weeks, or for 1906 to date, have been eighteen per cent above the average specifications for the whole of 1905. There was no large bunch of specifications to swell the 1906 returns disproportionately, for the specifications have been running with rare uniformity week by week. A marked increase in the consumption over last year seems to be the only adequate explanation. This great expansion in the use of finished steel products has been keeping the supply of billets practically down to the disappearing point. For the crude steel that is available there is lively competition among the various consuming mills. Because of this extreme scarcity, some of the finishing mills, like the wire and nail plants, have entered upon the policy of running with moderation and of supplying the trade with their accumulated stocks, taking chances of renewing these surplus stocks during the usually dull months of summer. The orders at western steel mills at present are for about 350,000 tons, or something more than a three months' run. This by no means represents the total tonnage specified, for much of the latter is withheld at the manager's office, only the orders for immediate filling being sent to mill. The statement is all the more significant when it is added that there is included in this tonnage at mill order books only about a two months' output for steel rails, the South Chicago mill, as is well known, having its output sold ahead for almost the entire year. Sheet mills are reported to be falling behind in their orders and this is the general tendency.

Pig Iron.—There are two kinds of a market existing in the local field. One is for spot shipment, and the other is for iron for forward delivery. The former is quite active, but the latter is dull and weak. There is a very general desire among western foundrymen to obtain good sized shipments on their contracts before the 25-cent advance in southern freight rates, announced to take effect March 1, becomes operative. Those who are not covered are buying in lots ranging from carloads to 500 tons. For business of this character, it is comparatively easy for southern furnaces to get $14.50 Birmingham for No. 2 foundry, but not so on inquiries or orders for future shipment. A lower basis would doubtless invite a round number of orders, aggregating a good-sized tonnage; but while a number of transactions have been closed on the basis of $14, it is doubtful if any general change will be made as long as the present disparity between northern and southern irons exists. The Allis-Chalmers' inquiry for 15,000 tons has been withdrawn because of their inability to get desirable quotations. The specifications for this large lot called for only one grade, this being 2 per cent silicon; .05 sulphur: .60 to .90 phosphorus, and .50 to 1 per cent manganese. On the southern proportion, it is said that one furnace quoted as low as $13.75 Birmingham. Northern iron remains strong at $19 Chicago for No. 2 foundry. There is some weakness in southern silvery owing to the plentiful supply offered, one lot of 1,000 tons, ranging from four per cent to six per cent silicon, having been closed at $14.50 Birmingham, or $18.15 Chicago, a reduction of $1 a ton. Low grade irons are also weak, sales of gray forge having been made on a basis equivalent to $13.50 for No. 2 foundry. Our prices given below are for forward deliveries, the southern quotations including the 25 cent advance in freight rates, effective March first.

Lake Superior charcoal	$20.00
Northern Foundry No. 1	19.50
Northern Foundry No. 2	19.00
Northern Foundry No. 3	18.50
Northern Scotch Foundry	19.50
Ohio Strong Softeners No. 1	20.30
Ohio Strong Softeners No. 2	19.80
Southern Foundry No. 1	18.40
Southern Foundry No. 2	17.90
Southern Foundry No. 3	17.40
Southern Foundry No. 4	17.15
Southern No. 1 Soft	18.40
Southern No. 2 Soft	17.90
Southern Gray Forge	16.40
Southern Mottled	16.15
Southern Silveries (4 percent to 6 percent Silicon)	18.40 to 18.90
Jackson Co. Silveries, 8 to 10 percent Silicon	23.30 to 24.30
Alabama and Georgia Car Wheel	22.65
Malleable Bessemer	19.50
Basic Iron	18.05

Coke.—Influences in the coke market are conflicting. There are some premonitions that the threatened coal miners' strike may unfavorably affect the coke supply and this generates both a disposition among producers to hold out for better prices and among users to provide themselves with a more than ordinarily good supply. But the receipts of coke into this district from the Pocahontas, New River and Kanawha regions have considerably increased and those grades are inclined to weakness. Connellsville coke is scarce and is holding firm at about $3.25 ovens, for standard 72-hour product.

Billets and Wire Rods.—Crude steel in all forms is both scarce and strong. Trading in forging billets proceeds regularly, with a ready market for all offerings and with prices unchanged at $35 to $36.

Iron and Steel Bars.—The feeling in the iron bar market is somewhat stronger. There was marketed a week or two ago a "job lot" of iron, which went at some concession under 1.75c. But since then the market has at least partially righted. While 1.70c may still be obtained on a large inquiry, the generality of trading is said to be at 1.75c. The inquiry has somewhat improved. Little is doing in steel bars by way of new business, but there is little trading in sight until buying begins for the last half of the year, for most users have contracts running to mid-summer and present buying is only for supplementary lots. Deliveries continue about three months behind. We quote carload lots, Chicago, delivery, as follows: Soft steel bars and bands, 1.66½c half extras; soft steel angles, less than 3 x 3, 1.76½c; hoops, 2.06½c base, full extras; old rail stock, 1.70c to 1.80c. There is a good movement from local warehouses and jobbers' prices are firm. We quote bar iron, 2.25c full extras; soft steel rounds and squares, 3 inches and larger, $2 per 100 pounds base; flats, 2 inches to 4 inches by 1⅛-inch and thicker, $2 per 100 pounds base; flats, 4½ inches x 5 inches and 6 inches x 5-16 inch and thicker, $2 per 100 pounds base; all ovals, half ovals and half rounds, $2 per 100 pounds base; steel bands, $1.95 to $2.00 half extras; soft steel hoops, $2.30 to $2.40 full extras. Other sizes not mentioned above, $1.85 per 100 pounds base, plus half extras.

Merchant Steel.—There is a continuance of the brisk movement of merchant steel from mills on specifications, the current requirements keeping the capacities of the mills fully engaged. The market is very firm. Mill shipments are quoted as follows:

Spring steel, 2.10c; sleigh shoe, flat

sizes, 1.71½c; concave and convex, 1.86½c; cutter shoe, 2.35c to 2.40c; smooth finished machinery steel, 1.91½c; smooth finished tire, 1.86½c base; plow steel, 2.20c and upward, according to quality; toe calk steel, 2.21c; railway spring, 1.86½c. Cold rolled shafting, 50 per cent off in carload lots and 45 per cent in less than carload lots. Crucible tool steel, 6½c to 8c; special grades of tool steel, 13c and up.

Cast Iron Pipe.—No large municipal contracts are reported this week, but there is a good run of trade in small lots and prices are unchanged, as follows: 4-inch water pipe, $31; 6, 8, 10 and 12-inch, $30; larger sizes, $29.50; gas pipe $1 extra.

Structural Material.—Jobbers are busy with inquiries and orders and there is already a brisk movement of shapes from store to the country trade. Because of the inability of mills to furnish steel with any degree of promptness, the wholesalers are obtaining a large amount of trade that ordinarily would go to mills. One store contract was taken at Denver last week for 800 tons. At Chicago there is still considerable prospective business not yet closed. Prices are without change, as follows:

Beams and channels, 3 to 15 inches, inclusive, 1.86½c; angles, 3 to 6 inches, 1.86½c; angles, larger than 6 inches, on one or both legs, 1.96½c; beams, larger than 15 inches, 1.96½c; zees, 3 inches and over, 1.86½c; tees, 3 inches and over, 1.91½c, with the usual extras for cutting to exact lengths, punching, coping, bending, or other shop work. Quotations on lots from store are as follows: All angles, 3 inches and larger, $2.25 per 100 pounds base; tees, 3 inches and larger, $2.30 per 100 pounds base; 3, 4, 7, 8, 9, 12 and 15-inch beams, $2.25 per 100 pounds base; 5, 6 and 10-inch beams, $2.50 per 100 pounds base; 18, 20, and 24-inch beams, $2.35 per 100 pounds base; 3, 4, 7, 8, 9, 10, 12 and 15-inch channels, $2.25 per 100 pounds base; 6 and 10-inch, 15-pound channels, $2.50 per 100 pounds base; 12-inch, 20½ pound channels, $2.35 per 100 pounds base; 5-inch channels, $2.75 per 100 pounds base.

Rails and Track Supplies.—The demand for track supplies is very eager and there is great difficulty in getting them accepted, for some of the larger mills have already sold up their expected output for the year and are refusing additional business. A few inquiries for steel rails from electric railroads are in the market and present trading is mainly of that character. Prices are without change as follows, all f. o. b. mill:

Heavy sections, $28; light rails, 12-pound sections, $31; 16-pound, $30; 20-pound, $29; 25-pound, $28; 30-pound and heavier, $27 to $28. Track supplies, angle bars, 1.50c to 1.75c; spikes, 2.10c; track bolts, 3½ x ¾, with square nuts, $2.55 to $3.00 per 100 pounds; with hexagon nuts, $2.70 to $3.15.

Merchant Pipe.—Trade has for some weeks been rather above the average for winter and there is no diminution in that condition. There is no change in prices, though some jobbers and consumers seem to have stocked up to some extent on surmises of an advance. The consumption is brisk. We quote carload lots, f. o. b. Chicago, ¾ to 6-inch black steel pipe, 78.35 per cent discount from list, and galvanized, 68.35 per cent. Minimum quotations from store are 76½ to 77 per cent discount on the base sizes, ¾ to 6-inch black steel pipe.

Boiler Tubes.—Quite a livening up in the demand for boiler tubes is reported this week. The inquiry comes from consumers and the material seems to be going directly into use. Prices are firm, official discounts being as follows:

	Steel	Iron	Seamless
1 to 1¼ inches	40.35	37.35	53.00
1¾ to 2¼ inches	54.35	39.35	40.00
2½ inches	56.35	44.35	43.00
2¾ to 5 inches	62.35	51.35	
Up to 4¼ inches			50.50
6 to 13 inches	52.35	37.35	

Less than carload lots, from store, as follows:

	Steel	Iron	Seamless Steel
1 to 1¼ inches inclusive	40	35	42½
1¾ to 2¼ inches, inclusive	50	35	35
2½ inches, inclusive	52½	35	36
2¾ to 5 inches, inclusive	60	47½	42½

Wire Products.—That the demand from consumers upon the retail and jobbing trade is urgent is shown by the earnest correspondence that follows any slowness of transportation. In some parts of the south and southwest the railroad companies are a little backward and the delays in transportation occasion disappointment to the buyers. The volume of business is large and though the capacities of the mills have considerably increased over a year ago the increased production is being fully consumed by the trade. There is a shortage of wire rods and because of it accumulated stocks of wire products will be depleted during the next few months very materially. We quote carload lots to jobbers, Chicago delivery, as follows:

Wire nails, $2; painted barbed wire, $2.15; galvanized barbed wire, $2.45; smooth annealed wire, $1.85; smooth galvanized wire, $2.15; polished staples, $2.15; galvanized staples, $2.40. Carload lots to retailers, 5 cents higher than above prices; less than carload lots, 15 cents higher.

Sheets.—It is stated that both with the leading producers and some of the smaller makers of sheets, the tide of demand has swept beyond the supply, so that deliveries are being made with increasing difficulty. Under this condition the market is naturally strong. Prices are without change, mill shipments, carload lots being quoted as follows:

Nos. 8, 9 and 10, 1.86½c; Nos. 11 and 12, 1.91½c; Nos. 13 and 14, 1.96½c; Nos. 15 and 16, 2.06½c. Box annealed, Nos. 18-20, 2.26½c to 2.31½c; Nos. 22-24, 2.36½c; No. 26, 2.41½c; No. 27, 2.46½; No. 28, 2.56½c; No. 29, 2.71½c; No. 30, 2.81½c. Jobbers' prices are as follows: No. 10, 2.15c to 2.25c; No. 12, 2.20c to 2.30c; No. 14, 2.25c to 2.35c; No. 16, 2.35c to 2.45c; Nos. 18 and 20, 2.50c to 2.55c; Nos. 22 and 24, 2.55c to 2.60c; No. 26, 2.60c to 2.65c; No. 27, 2.65c to 2.70c; No. 28, 2.70c to 2.75c; No. 30, 3.15c to 3.20c.

Quotations on galvanized shipments, carload lots, mill shipments, are as follows: Nos. 10-11, 2.51½c; Nos. 17-21, 2.86½c; Nos. 22-24, 3.01½c; Nos. 25-26, 3.21½c; No. 27, 3.41½c; No. 28, 3.61½c; No. 29, 3.86½c; No. 30, 4.11½c. From store, galvanized sheets are quoted as follows: Nos. 10 and 20, 3c to 3.10c; Nos. 22 and 24, 3.15c to 3.25c; No. 26, 3.35c to 3.45c; No. 27, 3.55c to 3.65c; No. 28, 3.75c to 3.85c; No. 30, 4.95c to 5c.

Plates.—While the demand for plates in the west has been relatively less than for some other products, it is worthy of note that the sale and the specifications of plates during the past few weeks have been about equal to the production. Just what part of the recent order for plates for the four new lake boats will be obtained by the Chicago mills will be determined by the places at which these boats will be constructed. Prices are unchanged. We quote mill prices, Chicago delivery, as follows:

Tank steel, ¼ inch and heavier, up to 100 in. wide, 1.76½c base; flange steel, 1.86½c base; marine steel, 1.96½c base; all full extras. Plates 3-16 inch thick, $2 extra; gauges, 7 to 8, $3 extra; No. 9, $5 extra. Less than carload lots, $5 extra. Store prices are very firm. We quote from local stocks: tank steel, ¼ inch and heavier, up to 72 inches wide, 2c to 2.10c; 72 inches to 96 inches wide, 2.10c to 2.20c; 3-16 inch up to and including 60 inches wide, 2.10c to 2.20c; 3-16 inch 72 inches wide, 2.35c to 2.45c; No. 8, up to 60 inches wide, 2.15c to 2.25c; flange steel, 25c extra; heads, 25c extra.

Old Material.—There is further weakness in old material. It is more general, and affects all grades. Consumers generally are sufficiently well provided with scrap to make additional purchases optional and they are exercising that option to their own best advantage. They are willing

to buy at what looks like bargains, but the large tonnage that is offered for sale keeps pressing the market down and values have been steadily receding during the week. New lists out this week include one of 2,000 tons from the Burlington and one of 1,000 tons from the C. & E. I.

Old Steel Rails (4 feet and over)	$15.50 to 16.00
Old Steel Rails (less than 4 feet)	14.50 to 15.00
Old Car Wheels	19.00 to 19.50
Old Iron Rails	21.00 to 21.50
Relaying Rails, subject to inspection	27.00 to 27.50
Heavy Melting Steel	14.50 to 15.00
Mixed Country Steel	11.50 to 12.00
No. 1 R. R. Wrought	$15.50 to 16.00
No. 2 R. R. Wrought	14.50 to 15.00
Shafting	17.00 to 17.50
Dealers' Forge No. 1	12.00 to 12.50
Wrought Pipe and Flues	11.50 to 12.00
No. 1 Cast, 150 pounds and less	13.00 to 13.50
No. 1 Mill	8.50 to 9.00
No. 1 Busheling	10.50 to 11.00
No. 2 Busheling	10.00 to 10.50
Country Sheet	8.00 to 8.50
No. 1 Boilers Cut	11.50 to 12.00
Boiler Punchings	14.00 to 14.50
Iron Car Axles	23.00 to 23.50
Steel Car Axles	20.00 to 20.50
Iron Axle Turnings	11.50 to 12.00
Cast Borings	9.00 to 9.50
Mixed Borings, etc.	9.00 to 9.50
Machine Shop Turnings	11.00 to 11.50
Ralroad Malleable	14.00 to 14.50
Agricultural Malleable	12.50 to 13.00
Stove Plate and Light Cast Scrap	10.50 to 11.00
Old Iron Splice Bars	17.50 to 18.00

PIG IRON PRODUCTION IN CANADA.

Statistics received by James M. Swank, of the American Iron & Steel Association from the pig iron manufacturers in Canada show that the total production of all kinds of pig iron in the Dominion in 1905 amounted to 468,003 gross tons, against 270,942 tons in 1904, an increase of 197,061 tons, or over 72 per cent. This was the largest year in the history of the country exceeding 1902, the year of next largest production by 148,446 tons, or over 46 per cent.

Of the total production in 1905, 432,870 tons were made with coke, 4,836 tons with coke and charcoal mixed and 30,297 tons with charcoal. In all 172,102 tons of basic pig iron were produced in 1905, against 70,133 tons in 1904, by three companies owning six furnaces, while the production of Bessemer pig iron was 149,203 tons in 1905, by three furnaces owned by two companies, compared with 26,016 tons in 1904. No spiegeleisen or ferro-manganese has been produced in Canada since 1899, the furnace in Nova Scotia for their production having been abandoned.

The production of malleable Bessemer pig iron in Canada in 1905 amounted to 3,300 tons; foundry pig iron, 139,528 tons; forge pig iron 3,500 tons; and white and mottled and miscellaneous grades of pig iron, including castings made direct from the furnace 370 tons. Neither ferro-silicon nor ferro-phosphorus was made. The quantity of limestone consumed for fluxing purposes by blast furnaces in Canada in 1905 amounted to 290,310 tons.

There were fourteen completed blast furnaces in Canada on Dec. 31, 1905, of which nine were in operation.

NEW YORK.

Pig Iron Market Unsettled.—Irregularity in Prices, Small Sales, Great Pressure for Shipment.

OFFICE OF *The Iron Trade Review*, ROOM 1315, No. 150 NASSAU ST., February 19

Pig Iron.—About the only noticeable features in the pig iron market of the past week have been a more or less nervous uncertainty concerning what is to come out of the present somewhat unsettled conditions and some irregularity of prices. Sales have been too few and of too exceptional a character to establish definite quotations. Purchases have been made at figures both above and below the prices prevailing for some weeks past. Investigation disclosed, in almost every case in which high demands had been met, some exceptional condition which minimized its general effect. On the other hand considerable southern iron No. 2 has been sold at $14, Birmingham, and this has undoubtedly created a slightly weaker undertone. The principal producers are still demanding $14.50 and in some cases receiving this price for No. 2 iron, but most of the uncompromising ones are not in the market except with small surplus lots. The effect upon purchasers is plainly perceptible. One inquiry submitted last week has been withdrawn and of the total now going the rounds, about 25,000 in the local trade, few lots are accompanied by that show of eagerness which presages quick business. In the meantime the pressure upon producers for early and even anticipated shipment is as great as ever, showing that consumption is still at or near the maximum. The strike cloud, although the signs of disintegration are becoming daily more evident, has had its influence upon the market and the unsettled conditions will doubtless disappear as soon as the coal mining question is decided one way or the other. Basic iron still seems to be in good demand. Sales of this grade included a lot of 2,000 tons of standard and a number of tons of off lots. The total sales of foundry iron in the local market probably did not exceed 5,000 tons. Among the most important were the following: 1,000 tons of No. 2 Virginia, for delivery to a New England machinery manufacturer during the first quarter; 250 tons of New York state No. 2; 500 tons from the same source; 600 tons of Ohio foundry; and an equal amount from eastern Pennsylvania and a few lots of Alabama and Virginia iron. There were also purchases of gray forge by pipe founders and a number of odd lots.

There is comparatively little change in the ferro-manganese market. Sales for spot or early delivery have been too inconsiderable to establish a fair price. Very small lots have been sold for $150 and $165 per ton. For second quarter $115 to $125 is quoted and the price demanded for fair sized lots for delivery in the second half is $90 per ton.

Northern No. 1 Foundry	$18.50 to 19.00
No. 2 Foundry	18.00 to 18.50
No. 2 Plain	17.75 to 18.00
No. 1 Southern Foundry	18.50 to 18.75
No. 2 Southern Foundry	17.75 to 18.50
No. 3 Southern Foundry	17.25 to 17.75
No. 4 Foundry	16.75 to 17.25

Pig Iron Certificates.—There has been more interest shown in both certificates and warrants during the week and there was some trading at lower prices but the changes were inconsiderable. Foundry iron warrants as follow:

	Bid.	Asked.
Cash	16.00	17.00
February	16.00	17.00
March	16.00	16.75
April	16.15	17.00
May	16.25	17.00
June		

Finished Iron and Steel.—Little change is to be noted in the market for finished products. Estimates on the immense tonnage of structural business yet to be placed have kept the big offices in a stir, but the new contracts actually awarded have been few. The American Bridge Co. has already brought the total tonnage booked in February up to that of January. A number of small jobs were disposed of during the week, the most considerable being another 300 tons of material for the Lake Shore Railroad. Milliken Bros. Inc. secured the contract for the steel for the Humboldt Bank to be erected in San Francisco, and the remainder of the work to be done upon the Gould plant at Seneca Falls, N. Y., involving the construction of ten buildings and the erection of about 1,000 tons of steel. The labor situation in the local building trades is gradually improving and from now on the new business now pending is expected to come to a head more rapidly. Rail sales have been of normal volume. The trolley roads are at the present time an important factor in the rail market, purchases for new lines being large. It is expected that trolley rails will reach the totals of the record year of 1903. Plates are in good demand and premiums above official figures are still secured on occasional small lots, but less frequently than a few weeks ago. Small quantities of structural shapes also bring a bonus, but this is disappearing gradually. The pressure for delivery of structural material has not been relieved, but there are fewer of the small jobs which demand the supply of material at once at almost any cost. Bar iron has been dull and easy. The following are the prices at tidewater: Angles, 3 to 6 inches x ¼ inch and heavier, 1.84½c;

beams, 3 to 15 inches, 1.84¼c; tees, 3 x ¼ inch and heavier, 1.89½c; plates, carloads, tank, 1.74½c; flange, 1.84½c; marine boiler, 2.41½c; refined iron bars, 1.84½c to 1.89½c; soft steel bars, 1.64½c to 1.84½c; sheets, No. 28 black, 2.40c.

Old Materials.—The market is in the buyers' direction all along the line. A disposition to sell developed during the past week among holders who had long held firm. Sales have been made under all sorts of conditions and there are no positive market values. Sales of heavy melting scrap include 3,000 tons in shape for charging to be delivered in eastern Pennsylvania, later increased by 500 tons; and 300 tons to another purchaser. An offer of 5,000 tons found no buyers. Of scrap rails 1,500 tons exchanged hands; a sale of 500 tons of low phosphorus scrap is also reported. The following prices are approximately f. o. b. tidewater.

Old iron rails	$21.00 to 22.00
Old steel rails, long lengths	14.50 to 15.00
Old steel rails, short pieces	14.00 to 14.50
Relaying rails	22.00 to 23.00
Old car wheels	17.50 to 18.00
Old iron car axles	24.00 to 25.00
Old steel car axles	18.00 to 19.00
Heavy melting steel scrap	14.25 to 14.50
No. 1 railroad wrought scrap	18.00 to 19.00
Iron track scrap	16.50 to 17.00
Wrought pipe	13.50 to 14.00
Cast borings	10.00 to 10.25
Wrought turnings	14.00 to 14.50

CLEVELAND.

Scarcity of Bessemer Ore.—Improved Tone of Pig Iron Market.

OFFICE OF *The Iron Trade Review*,
BROWNING BUILDING, February 20.

Iron Ore.—It has developed during the past week that a number of furnaces which are now running on Bessemer ore have practically exhausted their supply and will be forced to change to other grades of iron until the opening of navigation enables them to secure shipments of Bessemer. At least one Ohio furnace is in this predicament. While the probability of a general coal strike is still discounted, vessels are being generally loaded with coal in order to be prepared should the first of April arrive without the conclusion of negotiations avoiding difficulty in the coal regions. Practically no ore is being sold at present, and the movement from docks is only moderate. We quote Old Range Bessemer $4.25; Mesabi Bessemer, $4.00; Old Range Non-Bessemer, $3.70; and Mesabi Non-Bessemer, $3.50.

Pig Iron.—The market continues the improved tone of the last week, which is further strengthened by the impression that a buying movement of considerable extent is inevitable within a short time. Traveling men report that foundry yards are practically bare, and that the heavy melt is proceeding on a very narrow margin of stock. Furnace yards in this district contain little iron, and in some instances shipments from make are forced to supply the demands of foundries, which have been anticipating on contracts all through the winter. The foundries are contributing most largely to current business, which continues to be made up principally of small lot orders, though with occasional good sized inquiries which are usually speedily converted into sales. Prices are firm, with foundry iron at $17.50 valley for No. 2. The aggregate sales in this district last week were in the neighborhood of 12,000 tons. There is considerable activity in basic iron, with the price about $17.00 valley, Bessemer is firm at $17.25 valley, and in some cases better prices are procurable. Foundry iron is selling locally at $17.75 for No. 2 delivered, and is firm at that price. Southern No. 2 iron can still be bought at $14 Birmingham. Foundry coke has grown suddenly stronger on the development of heavy inquiries in the east, and practically no spot coke is to be had. Contract foundry coke is procurable at $3.00 to $3.25 at the oven. In furnace grades ovens are well sold up and current quotations of $2.35 to $2.50 cannot be shaded. We quote Cleveland delivery as follows:

Bessemer	$18.10 to 18.35
No. 1 Foundry	18.00 to 18.50
No. 2 Foundry	to 18.00
No. 3 Foundry	to 17.50
No. 2 Southern	to 18.35
Gray Forge	to 16.85
Gray Forge, Southern	to 16.35
Lake Superior charcoal	to 20.00

Finished Materials.—The contract for 1,700 tons of standard 60-foot steel rails for the Lake Shore Electric went to the steel corporation for rolling at the Lorain plant. Delivery will be made through April, May and June. Considerable business is being done in light rails with one good inquiry pending.

Structural materials, except in certain heavy sizes can be secured for immediate delivery. This unusual condition of affairs has been brought about not through any dimunition in demand, but through the persistent refusal of a number of mills all through the winter to accept new orders. Building is extremely active and sales from stock are heavy, although they are interfered with somewhat by the delayed delivery of shapes which were ordered for use several months ago, and which have been shipped but recently. Some premium business is still being done. Sheets are in good demand with prices fairly well observed. Delivery is rather slow. Plates are selling readily for immediate shipment. The demand has eased somewhat and mills are turning out a much heavier tonnage than was anticipated. Bar iron continues its wide range of prices from 1.60c reported as the quotation of certain eastern mills to 1.70c and 1.80c at Ohio plants, which is the top figure for current business. Steel prices have also assumed an easier tone. Mills which have been selling billets for early delivery have filled up on orders and are now several months behind.

Old Material.—The week has seen a still further decline on the prices of scrap, with practically no business being done. We quote f. o. b. Cleveland as follows:

Old Iron rails	$22.50 to 23.50
Old steel rails (over 6 feet)	16.25 to 16.75
Old steel rails (under 6 feet)	16.50 to 17.50
Old car wheels	17.00 to 17.50
Steel boiler plate	13.00 to 14.00
Steel axles	21.00 to 22.00
Malleable iron (railroad)	15.50 to 16.50
Malleable iron (agricultural)	14.00 to 15.00
Heavy steel	15.00 to 15.50

We quote as follows, net tons:

No. 1 R. R. wrought	15.00 to 16.00
No. 1 busheling	13.00 to 14.00
No. 1 machine cast	13.25 to 13.75
Iron axles	22.00 to 23.00
Axle turnings	11.00 to 12.00
Wrought turnings (free from cast)	10.50 to 11.50
Grate bars	9.50 to 10.00
Pipes and flues	12.00 to 13.00
Tank iron	10.50 to 11.00
Hoop and band iron	7.50 to 8.00
Sheet iron	6.50 to 7.00
Wrought drillings	12.50 to 13.50
Stove plate	10.50 to 11.00
Cast borings	7.50 to 8.00

CINCINNATI.

Low Grades of Pig Iron Weak.—Prices in Other Grades Are Firm.

February 20, 1906.

Pig Iron.—During the week, buying has been mainly of small lots for prompt shipment. The feature of interest was the purchase in Pittsburg of about 3,000 tons of gray forge, at prices reported to be $12.00 and $12.15 Birmingham. These prices were not unexpected and simply verified the general understanding that low grades were weak and that sellers would make attractive prices to effect sales. Today a purchase of 300 tons of No. 3 foundry on the basis of $14.00 Birmingham for No. 2 foundry gives evidence that the $14.00 basis is well maintained on the higher grades. It is trade talk that warrant iron and re-sale iron is being offered at concessions which have a tendency to cause buyers to resist the $14.00 basis in making purchases, but so far as actual furnace prices are concerned, we hear of nothing below last week's quotations. Inquiries are light, only two of importance having developed; one for 1,000 tons on No. 2 foundry and 400 tons of silvery, and one for 1,000 tons of No. 4 foundry, both in this territory. It is said that the leading cast iron pipe interest has purchased a few small lots, but is making inquiries which are regarded to be significant of probable purchases. The sentiment prevailing among the sales agencies is that the dullness prevailing gives the market an easy tone, but that the actual situation shows no weakness, as consumption continues large

and furnaces are not believed to be accumulating iron excepting low grades. It is believed the situation is one which would respond quickly under the stimulus of any pronounced buying movement. The extent to which buyers are covered for the second quarter of the year is still a matter of conjecture and this will probably be the determining factor.

The advance in freight rates on pig iron from the south of 25 cents per ton will become effective March 1 and the printed tariffs are now in the hands of the public. This to some extent accounts for some of the prompt shipment business that has been placed and is also to some extent responsible for buyers ordering shipments hurried forward, as it was desired to get as much iron as possible shipped before the advanced freight rates took effect. One element in favor of buyers is that, while consumption is practically at maximum and the wants are being supplied without difficulty, production is constantly increasing. This argument has a tendency to make buyers complacent about sufficiency of supplies and acts as a check against anticipating their wants at the present level of quotations. We quote f. o. b. Cincinnati:

Southern Foundry No. 1	$17.25 to 17.50
Southern Foundry No. 2	16.75 to 17.00
Southern Foundry No. 3	16.25 to 16.50
Southern Foundry No. 4	15.25 to 15.50
Southern Foundry No. 1, soft	17.25 to 17.50
Southern Foundry No. 2, soft	16.75 to 17.00
Gray Forge	15.00 to 15.25
Northern Foundry No. 1	18.90 to 19.15
Northern Foundry No. 2	18.40 to 18.65
Northern Foundry No. 3	17.90 to 18.15
Jackson County Silvery, 8 per cent	21.15 to 21.65
Southern Charcoal	22.75 to 23.25

Coke.—Business has been fairly good mostly for prompt shipment and prices are steady and unchanged. There is no contracting being done for either furnace or foundry cokes, but this is not expected until May or June. Quotations in the leading coke producing districts are as follows:

†Wise County, Va. Furnace Coke prompt shipment	$2.50 per ton
Wise County, Va. Foundry Coke prompt shipment	3.00 to 3.25 per ton
Pocahontas Furnace Coke on contracts	2.50 per ton
Pocahontas Foundry Coke on contracts	2.75 to 3.00 per ton
Connellsville Furnace Coke prompt shipment	2.50 per ton
Connellsville Foundry Coke prompt shipment	2.90 to 3.15 per ton
New River Foundry Coke on contracts or prompt shipment	3.00 to 3.25 per ton
New River Furnace Coke, prompt shipment	2.50 per ton

†Wise County, Va., Coke on Furnace contracts is sold mainly on a sliding scale basis for pig iron prices on the following basis: $1.65 per ton on $9.00 pig iron, plus 17 per cent of the advance on pig iron above $9.00 Birmingham

Finished Material.—The market remains firm and fairly active. Bar iron is quoted at 1.80c to 1.85c and the recent advance in sheets is well sustained. We quote: steel bars at 1.63c, half extras, with dealers quoting 1.85c for iron and steel out of store. Galvanized sheets, No. 10 and No. 12, in car lots are 2.58c. We quote black sheets, No. 27 at 2.40c in car lots of 500 bundles. Black sheets out of store are selling as follows: No. 28, 2.85c; No. 27, 2.75c; No. 16, 2.35c; No. 14, 2.25c; No. 12, 2.15c. Tank plates are firm and sell out of store at 2 to 2.10c for ¼-inch and 2.10c for 3-16, Nos. 8 and 10. Beams and channels are quoted at 2.25c to 2.35c from stock and angles at 2.10c to 2.15c for base sizes.

In merchant pipe the leading interest still withholds quotations on wrought iron pipe and will furnish prices only on application with specifications. The demand is quite satisfactory and the market is steady to firm. We quote f. o. b. Cincinnati.

MERCHANT PIPE.
(Basing Discounts)

	Steel Pipe		Guaranteed Wrought Iron Pipe	
	Black Per cent	Galv. Per cent	Black Per cent	Galv. Per cent
⅛ and ¼ inches	69.7	53.7	....	....
⅜ inch	73.5	61.3	....	....
½ inch	73.7	61.7	....	....
¾ to 6 inches	77.7	67.7	....	....
7 to 12 inches	72.7	57.7	....	....

Old Material.—The market is easy and dealers are inclined to make quick trades without accumulating stock. Prices are irregular and with market difficult to quote. We quote f. o. b. Cincinnati:

Old No. 1 railroad wrought, net tons	$16.00 to 16.50
Cast machine and foundry, net tons	13.00 to 13.50
Old iron rails, gross tons	21.00 to 22.00
Old steel rails, gross tons	15.50 to 16.00
Old short lengths, gross tons	16.00 to 17.00
Old iron axles, net tons	22.00 to 23.00
Stove plate, net tons	10.50 to 11.00
Wrought turnings, net tons	10.50 to 11.50
Cast borings, net tons	9.00 to 9.50
Car wheels, net tons	17.00 to 17.50

PHILADELPHIA.

Bar Iron and Scrap Weak.—Other Prices are Firm.

February 20.

Pig Iron.—With the exception of old material and bar iron, which are inclined to weakness, the iron and steel markets seem to have largely regained the confident tone which prevailed so long. Some of this recovery is doubtless due to the brighter prospects of a peaceful solution of the coal situation. The buying during the past week has not been large, but the insistent demands of consumers, including some very large concerns, for prompt delivery or anticipation of orders show how closely consumption is keeping pace with production and help to keep prices steady. It can be stated on the best of authority that the orders on the books of eastern pig iron producers are now larger than they have been before and were very materially greater on Feb. 1 than they were on Dec. 1. Under such circumstances, which assure increasing activity until at least July 1, furnace men naturally decline to make any concessions, even though buyers do hold off. Basic and low phosphorus still continue in greatest demand, and gray forge apparently the most inclined to lag. The market has been quiet, and there has been no change in prices, which may be quoted as follows:

No 1X Foundry	$19.00 to 19.50
No. 2X Foundry	18.50 to 18.75
No. 2 Plain	18.00 to 18.25
Standard Gray Forge	16.50 to 17.00
Basic	18.00 to 18.25
Low Phosphorus	24.50 to 25.50
Southern No. 2X, rail	18.75 to 19.00

Finished Material.—Plates are selling at a premium of $2 a ton for reasonably prompt delivery, but bar iron continues rather weak. The market generally continues firm under the heavy accumulation of orders on the books of the mills, which insure a steady business far into the last half of the year. Quotations remain unchanged, as follows: Beams, channels and angles, according to specifications, 1.82½c to 2.25c; refined iron bars, 1.75c to 1.85c; steel bars, 1.63½c to 1.83c; plates, 1.83½c to 1.88½c.

Old Material.—Few sales are reported, as the mills seem to have accumulated large quantities of scrap. One establishment, which is one of the biggest consumers in this territory, has purchased no less than 37,000 tons. In the absence of demand prices continue to droop, and may be quoted as follows:

Old steel rails	$17.00 to 17.50
No. 1 steel scrap	16.50 to 16.75
Old steel axles	20.50 to 21.00
Old iron axles	25.50 to 26.50
Old iron rails	22.50 to 23.00
Old car wheels	18.50 to 19.00
Choice scrap, R. R. No. 1 wrought	20.00 to 20.50
No. 1 yard scrap	18.00 to 18.50
Machinery scrap	16.00 to 16.50
Low phosphorus scrap	22.50 to 23.00
Wrought iron pipe	15.00 to 15.50
No. 1 forge fire scrap	15.00 to 15.50
No. 2 forge fire scrap, ordinary	12.25 to 12.75
Wrought turnings	14.75 to 15.25
Axle turnings, heavy	15.00 to 15.50
Cast borings	10.50 to 10.75
Stove plates	12.75 to 13.25

BIRMINGHAM.

Southern Pig Iron Prices Manifest An Upward Tendency.

Birmingham, Ala., Feb. 19, 1906.—While the demand during the past week has not been active, the southern pig iron market is still in a satisfactory condition. The quotations are very firm and inclined to be looking upward. No. 2 foundry has been sold again at $14.50 per ton, though $14 iron long-time delivery can be had in plenty. The shipments of iron ore are simply enormous and there is every indication that many of the orders which are delayed a little at this time will be caught up with by the end of the month. The statement of the Alabama Car Service Association for the month of January, 1906, shows 71,687 cars handled against 59,288 for the same month in 1904. Inasmuch as the greater portion of the car service report is made up in

the industrial section of the state it can be seen that there is great activity on. The report for the month of February, despite that there are only 28 days in the month, promises to be as active as it was in January.

It is given out that considerable buying is going on among the machinery manufacturers. Orders have been placed in this district for iron with delivery during the third quarter of the year. There is still no change in the production, the weather being most favorable for the production of raw material on a large scale and the manufactured product.

The following quotations are given: No. 1 foundry, $14.50 to $15; No. 2 foundry, $14 to $14.50; No. 3 foundry, $13.50; No. 4 foundry, $13; gray forge, $12.50; No. 1 soft, $14.50 to $15; No. 2 soft, $14 to $14.50.

The steel industry in this district is very active. The delivery of rail on orders booked some time ago is being pushed now, the railroads urging delivery just as quickly as possible.

The official figures of State Mine Inspector J. M. Gray as to the coal output for the year 1905, given out the past week show that the output amounted to 11,900,153 tons, against 11,273,151 tons. There were 17,218 men employed in and around the mines, of which number 11,875 were miners. Jefferson county produced the largest amount of coal, 5,816,164 tons of coal being the record for the year. Walker county produced 2,819,073 tons and Bibb county, 1,381,675 tons. The balance of the report came from the other ten coal producing counties in Alabama.

The Metal Market.

NEW YORK.

February 20.

Pig Tin.—Prices fluctuated violently during the week and the net result has been to place tin on a slightly lower basis. Purchases for domestic consumers were limited and abroad there was active pressure to sell. At present the market is very quiet. Today's quotations follow: Spot and February, 30.15 to 30.45; March, 36 to 36.35; April, 36 to 36.25; London £166 and £164 5s; arrivals for the month to date, 2,543; afloat, 3,185.

Copper.—The week has brought few changes. There were small sales and the pressure to sell is somewhat less. Today's closings follow: Lake, 17¾ to 18; electrolytic, 17⅝ to 17⅞; casting, 17½ to 17⅝; London's closing today: £78 12d 6s and £76 2d 6s. Exports for the month to date, 10,058 tons.

Lead.—The market has been dull, weak and lower, closing very quiet. Today's closings, 5.35 to 5.45; St. Louis, 5.27½; London, £16 3s 9d.

Spelter.—Refined spelter has been quiet and easy in tone. Today's closings, 6 to 6.10; St. Louis, 5.90; London, £26.

Antimony.—The market has been moderately active and firm. Today's prices: Cookson's, 16c to 17c; Hallett's 15c to 16c; other brands, 14¾c to 15½c.

CHICAGO.

February 20.

An improved demand for copper with difficulty experienced in getting same for early shipment has strengthened quotations on this product, and the market is fractionally higher. Other metals are not so firm, sheet zinc and pig lead being lower in price. We have revised our prices, and quote lake copper, 18½c to 18¾c in carload lots; casting copper, 18¼c to 18½c; pig tin, car lots, 37¾c to 38½c; less than car lots, 38½c to 39½c; spelter, 6⅜c to 6¾c for car lots; pig lead, desilverized, 5½c to 5¾c for 50-ton lots; corroding, 6c to 6¼c for 50-ton lots; sheet zinc, $7.50 list f. o. b. LaSalle, on car lots of 600-pound casks.

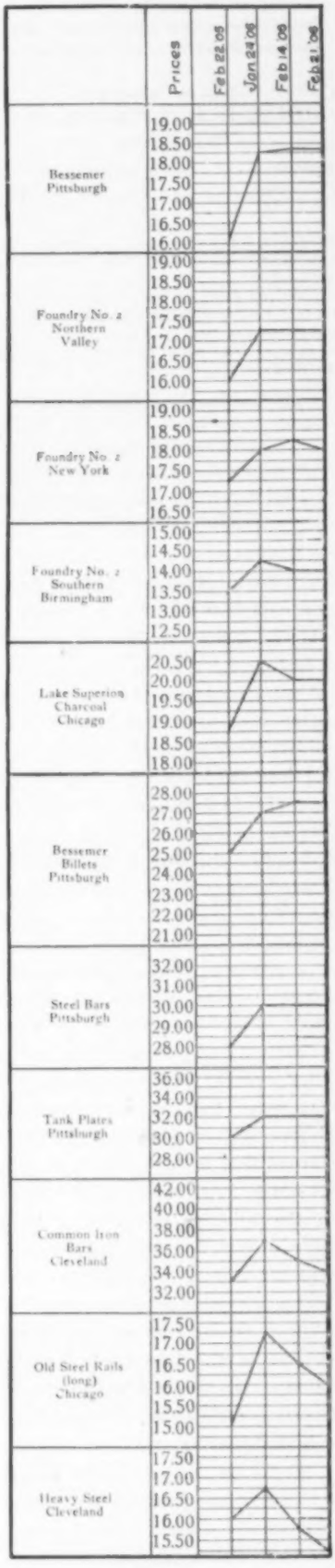
The old metals are in fair demand this week, quotations in a general way following the new metals. Approximate prices of local dealers are as follows: Copper wire, 15¾c; heavy copper, 15½c; copper bottoms 14½c; copper clips, 15½c; red brass, 14¼c; red brass borings, 12¼c; yellow brass, heavy, 10¾c; yellow brass borings, 9¾c; light brass, 8¼c; lead pipe, 4¾c; tea lead, 4½c; zinc, 4¾c.

The Elizabethport Brass Fdry. Co. now has its foundry at Elizabeth, N. J., in running order with a capacity of about 2,000 pounds per day. Frank J. Freund is president and Charles F. Hinde, secretary and treasurer.

J. H. Hoadley, of New York, president of the International Power Co., is quoted as saying, "I am advised that a statement was made that the control of the Alabama Consolidated Coal & Iron Co. would be purchased by president T. G. Bush and his friends. I would advise that the control of the company is already in the hands of Mr. Bush's friends and is likely to so remain. It is not for sale."

The order recently secured by the William Tod Co., of Youngstown, O., from the Bethlehem Steel Co., is for four pair of twin tandem compound reversing engines with cylinder dimensions, diameter 40, and 66 inches by 54-inch stroke, similar to the two pair of engines recently installed by this company at the plant of the Illinois Steel Co. Delivery will be made in about six months.

PRICE CHART.



THE IRON TRADE REVIEW

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PIG IRON AND LAKE SUPERIOR ORE TONNAGE.

Predictions of a larger movement of Lake Superior ores in 1906 than in 1905 are in line with the prospects of a heavier pig iron production this year than last, and in line with the general trend of consumption towards Lake Superior ores, as shown in these columns last week by detailed percentages of pig iron production in different districts. The final statistics of Lake Superior ore movement in 1905 are now available, and the comparison with pig iron production shows a distinct departure from the average of previous years, in the direction of a larger tonnage of Lake Superior ores, relative to the total pig iron production of the country. The accompanying table shows the pig iron production and Lake Superior iron ore shipments during the past 11 years, together with the ratio which the ore bore to the pig iron. The proportion of 1.55 shown in 1902 stands out by itself, and was due chiefly to the bringing down of a large quantity of ore by the steel corporation, to act as a reserve. It was then the intention of the corporation to establish a 25 per cent reserve at the lower end of the lake haul, but this intention was afterwards abandoned. The average ratio of the six years 1899 to 1904 inclusive is 1.38, and this has been practically representative of the ratio in any single year, taking account of variations in stocks. Now, however, comes 1905 with a ratio of 1.49, when the year did not close with any undue stocks. The increase represents nearly 3,000,000 tons of ore. Prior to 1899 the ratio was less than 1.38, being, back in 1895, only 1.10.

Not all of this increase in the ratio of Lake Superior ore is due to the replacement of other ore. A part is due to the decreasing richness of the Lake Superior ores which are used. The country has come to be so dependent upon the region that it takes ores which formerly were not considered worth mining. It would be interesting to ascertain the total iron content of the ores brought down each season for blast furnace use. While an estimate is not impossible, theoretically, the work of making it would be very arduous. There is, in addition, the increased quantity of ore which is brought down for direct use in the open-hearth steel furnace.

The Lake Superior ore shipments in 1905 were governed by the rate of pig iron production in the early part of the year, and the prospects for the balance of the year and for the months in 1906 before navigation opens. The prediction was upon a smaller tonnage than has actually been produced, or than is now being produced, say upon 22,000,000 tons of pig iron, whereas 23,000,000 tons were produced in 1905, and production since the first of this year has been at the rate of more than 25,000,000 tons and will probably so continue till the opening of navigation. The 1906 shipping season will, therefore, open with smaller stocks of ore at the lower end of the lake haul than was expected when the 1905 shipments were made. With smaller stocks than expected and a much higher rate of pig iron production than in 1905, it is fair to assume that Lake Superior shipments this year should be much larger than last year, and well on the way towards 40,000,000 tons, unless indeed there should be an early and decided decrease in demand for pig iron. The prospect for such an unfavorable and unexpected condition would have to become very distinct to affect shipments.

The total production of iron ore in the United States in 1905 will in due course be ascertained by the United States Geological Survey, but even approximate figures cannot be expected for some time. For previous years the Survey has done valuable work, in presenting not only the total production of the country, but in gathering approximate figures of iron ore stocks and

Pig Iron Production in U. S. and Lake Superior Iron Ore Shipments—GrossTons

	Pig Iron Production	Lake Superior Iron Ore Shipments	Ratio
1895	9,446,308	10,429,037	1.10
1896	8,623,127	9,934,828	1.15
1897	9,652,680	12,464,574	1.30
1898	11,773,934	14,024,673	1.20
1899	13,620,703	18,251,804	1.34
1900	13,789,242	19,059,393	1.40
1901	15,878,354	20,593,537	1.30
1902	17,821,307	27,571,121	1.55
1903	18,009,252	24,289,878	1.35
1904	16,497,033	21,822,839	1.32
1905	22,992,380	34,353,456	1.49

Pig Iron Production in United States and Iron Ore Consumption, gross tons and ratio:

	Pig Iron Production	Iron Ore Consumption.	Ratio.
1889	7,603,642	14,366,562	1.89
1890	9,202,703	16,302,025	1.77
1891	8,279,870	15,476,989	1.87
1892	9,157,000	16,032,687	1.75
1893	7,124,502	11,616,412	1.63
1894	6,657,388	11,600,393	1.74
1895	9,446,308	17,203,255	1.82
1896	8,623,127	15,765,128	1.83
1897	9,652,680	17,380,184	1.80
1898	11,773,934	20,708,604	1.80
1899	13,620,703	25,513,903	1.87
1900	13,789,242	26,722,583	1.92
1901	15,878,354	29,357,171	1.85
1902	17,821,307	35,886,921	2.01
1903	18,009,252	34,232,399	1.90
1904	16,497,033	30,224,910	1.83

then, by taking these into account, as well as imports and exports and the quantity of zinc residuum, arriving at figures which must pretty closely represent the iron ore consumption in each calendar year. This has been done since 1889. In the accompanying table the Survey figures of iron ore consumption have been set beside the pig iron production, and the ratio of ore to pig iron has been computed. The table shows no wide variation, or progression, over this 16-year period, as might possibly be expected on first thought. There is a mild decline in the ratio from 1889 to a minimum in 1893 of 1.63, an advance to an average of about 1.80 for several years, and a further but slight gain beginning with 1899. All this, however, is in strict conformity with the facts as they are known. In 1889 the Lake Superior ore shipments constituted but half the country's iron ore consumption. In each year after 1896 they constituted more than two-thirds. In the early years covered by the table, ores outside the Lake Superior region were more largely used, and they were leaner ores. The depression of 1893 bore most heavily on pig iron producing districts not tributary to the Lake Superior region, the furnaces using Lake Superior ores making the best showing, with the result that in the whole period it is 1893 which shows the smallest ratio of iron ore consumption to pig iron production. The trend towards Lake Superior ores is well shown by the decline in the ratio through 1894. Thereafter, the movement had been largely accomplished, and the governing factor becomes the richness of the Lake Superior ores used. This richness has decreased, and the increased ratio shows it in a statistical way.

DOLAN AND THE COAL STRIKE.

The farce comedy acted in the Pittsburg district miners' convention in the past fortnight would fail, if put on the stage, not through lack of absurdity, but from being regarded as too far from the real. Mr. Dolan voted with the operators at the Indianapolis convention and improved upon that dereliction by invoking the aid of the unpopular injunction to enable him to retain his seat. He repeatedly ignored strictly parliamentary acts on the part of delegates, because so much as to rule them out of order would permit an appeal to be made. It is hard to believe that anything Mr. Dolan has done in his fight against the miners' demand for an advance will really work towards the prevention of a strike. The doom of the interstate agreement is sealed, and a new arrangement must grow out of the chaos which has been invited. The central point in the whole matter is the offer at the Indianapolis convention of Mr. Robbins to show the books of the Pittsburg Coal Co., to determine whether coal has been selling at a higher or a lower average, and Mr. Mitchell's inability to make a satisfactory rejoinder. Coal prices have been low and coal has been plentiful, extending to consumers the most enticing invitation to stock up, which invitation they have accepted. They are well prepared for a very considerable curtailment of coal production.

THE GROWING DEMAND FOR STRUCTURAL STEEL.

The constantly increasing consumption of steel in the building industry marks a development which is likely to have important and lasting results. The use of steel shapes in the construction of office buildings, industrial plants, public edifices and dwellings was more extensive last year than ever before. Architects recommend this durable material more freely every year and the use of wood framing is rapidly diminishing. An order for several thousand tons of steel for the supporting skeleton of a sawmill, mentioned in our columns recently, calls attention to the complete surrender of wood to its rival.

The structural mills of the country are at present unequal to the demand upon their productive capacity, and it is safe to predict that the new and improved plants planned during the past few months will not remain idle long. Hitherto New York has been the best customer of the shape makers, the lofty construction necessary there by reason of the pressure for ground space making the use of slender durable framing members more obviously desirable than elsewhere. The builders of skyscrapers are not, however, the only source of the demand at present. The advantages of steel are felt everywhere throughout the country, and if the movement from wood to steel continues to extend, there is no knowing where it will stop.

The use of rails is almost wholly confined to the transportation and mining companies, but the need of buildings is universal. Every industry contributes to the prosperity in the business of rolling beams, angles and channels. This is only one of the reasons why the steel output of the United States is increasing by leaps and bounds, but it is not the least important one. The leaders in the industry who are now planning immense new steel plants are not unmindful of these facts and have good reason for their confidence in the future. The present prosperity in the steel trade is not a bubble likely to burst in the course of a few weeks or months.

THE TENNESSEE COMPANY'S REPORT.

The annual report of the Tennessee Coal, Iron & Railway Co. for the year ending Dec. 31, 1905, shows net earnings heavily increased over 1904, though somewhat smaller than in 1903, 1902 and 1900. The income account is as follows:

	1905.	1904.
Net earnings	$2,023,128	$1,562,797
Charges	771,716	761,583
Balance	1,251,412	801,214
Dep. and sinking fund	224,650	304,955
Surplus	1,026,762	496,259
Dividends	920,380	19,006
Surplus	106,382	477,253
Previous surplus	2,122,335	
Total surplus	2,228,717	

The net earnings for 1903 were $2,904,977; for 1902 they were $2,602,779; for 1901 they were $1,725,638; and for 1900 they were $2,347,027. The daily balance sheet for Dec. 31, 1905, is as follows:

Land account	$26,152,825
Plant and improvement account	11,284,215
Deferred charges to operations	2,935
Investments in property, land companies, etc.	289,833
Trust of bond sinking funds	38,459
Treasury securities	1,040,000
Cash	574,189
Bills receivable	85,791
Accounts receivable	1,387,863
Inv. in. prod. and sup. on hand	1,486,187
Total	$42,342,299
Liabilities.	
Common stock	$22,553,060
Preferred stock	248,300
Bonds outstanding	14,716,000
Guaranteed preferred stock Alabama Steel Ship Building Co.	440,000
Bad debts reserve fund	126,745
Insurance and contingent fund	32,414
Relining fund	1,970
Sinking fund general gold mortgage bonds	48,240
Royalty fund	73,430
Replacement fund	152,798
Bills payable	475,000
Accounted interest, undeferred dividends	598,666
Auditor's vouchers, payrolls and accounts payable	646,960
Profit and loss surplus	2,228,717
Total	$42,342,299

MERCHANT MARINE BILL STRONGLY INDORSED.

By a unanimous vote the Cleveland Chamber of Commerce placed itself on record this week as favoring governmental aid to shipping in the foreign trade, adopting the following resolutions presented by Mr. Harvey D. Goulder, president of the Merchant Marine League of the United States:

"Resolved that due consideration for the broad development of our foreign commerce and for the better safety of the nation demands the restoration of a foreign merchant marine under our flag.

"Resolved that the same purpose is being striven for and accomplished steadily by other nations in their own behalf.

"Resolved that we regard the work of the congressional marine commission as having been done with industry, fairness and discrimination, and therefore

"Resolved we recommend the prompt enactment and careful trial of the plan evolved by the commission and embodied in the Gallinger bill, so-called, which has recently passed the senate, and

"Resolved that copies of these resolutions be forwarded to the senators and representatives of Ohio in congress."

Before the resolutions were adopted, earnest speeches were made by Mr. F. F. Prentiss, president of the Cleveland Twist Drill Co., Col. J. J. Sullivan, president of the Central National Bank and Mr. Harry Coulby, president and general manager of the Pittsburg Steamship Co., the lake end of the United States Steel Corporation.

Mr. Prentiss spoke as a manufacturer representing how extremely important it was to have continuous access to the foreign field and how impossible it was to reach certain important fields, notably South America. He related that in a recent tour around the world he had met a number of American manufacturers who were abroad to extend their business and all of them were a unit in declaring that the one thing needful was the American ship. He added that he had gone around the world and had seen the American flag in only two places, one on a warship at Shanghai and the other on a three-masted schooner at Honolulu.

Col. J. J. Sullivan argued that the resolutions were not strong enough, saying that the American Bankers' Association, representing 7,000 members, had endorsed governmental legislation in favor of shipping without a dissenting voice at its recent convention in Washington.

The most important speech of all, however, was made by Mr. Harry Coulby. He considered it a happy circumstance that the movement for the support of American shipping through governmental aid should originate in Cleveland and regarded it as especially important that it should have the endorsement of the Chamber. His argument was that no city in the country had profited so greatly through governmental aid to shipping as Cleveland. By this he meant the great impetus which had been given to the city's growth through the deepening of lake channels by the general government. He said that when he first came to Cleveland it cost $1.50 to bring a ton of ore from the head of the lakes to Cleveland. The present rate is 75 cents a ton. He did not think it necessary to say that transportation was the life nerve of trade; nor did he think it necessary to argue that it was not the ship owner alone that had profited by the deepening of the channels and by the cheapening of transportation. The farmer who bought a piece of wire for his farm or the woman who bought a needle for her sewing had profited in like proportion. He did not thing the shipping bill was liberal enough but such as it is, it should be given a trial.

As to the adoption of the resolutions, Mr. Prentiss moved that owing to the importance of the subject as a national measure a special commission should be appointed to present the resolutions in person to congress. This motion was unanimously carried and the following have been appointed to go to Washington: H. D. Goulder, president of the Merchant Marine League of the United States; F. F. Prentiss, president of the Cleveland Twist Drill Co.; H. Coulby, president of the Pittsburg Steamship Co.; Col. J. J. Sullivan, president of the Central National Bank and Superior Savings & Trust Co. and former president of the National Board of Trade; James H. Hoyt, of Hoyt, Dustin & Kelley; Caesar Grasselli, president of the Grasselli Chemical Co., and D. Z. Norton, of Oglebay, Norton & Co.

The properties of the New Birmingham Iron & Land Co., comprising a furnace and about 20,000 acres of land in the vicinity of Rusk, Tex., have been sold by the sheriff for $16,000 to the Holland Trust Co. of New York which held a judgment of $150,000 against the Texas concern.

LA BELLE OPTION RUMORS.

It has been currently reported that new interests are at work trying to secure an option on the plants of the La Belle Iron Works at Steubenville, Ohio, and Wheeling, W. Va., since the option held by E. N. Ohl of Pittsburg expired February 15 and was not exercised. At that time, Mr. Ohl asked for an extension but was not successful in obtaining it in order to swing his deal. Although it was denied authoritatively some time ago that the Republic Iron & Steel Co. was interested in the first option, the name of John W. Gates is very prominently mentioned in connection with the renewed effort.

Globe furnace of the Globe Iron Co., Jackson, O., is being relined and repaired with such rapidity that the stack will probably be put in blast again about March 25. The resumption of deliveries of its low sulphur Jackson County silveries is expected to begin by April 1.

The C. O. Bartlett & Snow Co., Cleveland, reports recent sales as follows: mechanical dryer to the Masurite Explosive Co., Sharon, Pa.; rotary direct heat dryer to the Cleveland Asbestos Plaster Co., Cleveland; steam dryer to E. H. Stanton Co., Spokane, Wash.; car load of milling machinery to Mexico City; paint machinery to Frank Stuart, Wilkinsburg, Pa.; mining machinery to Dudley H. Norris, Lacatecas, Mexico; complete plaster plant to Mahoning Builders' Supply Co., Youngstown, O.; coal handling machinery to Monongahela R. Con. Coal & Coke Co., Pittsburg; paint machinery to Protectus Co., Philadelphia; mining machinery to Montana Zinc Co., Butte, Mont.; ash and cinder elevator to Cleveland Light & Power Co., Cleveland; special conveyor and elevator to Barnesville Glass Co., Barnesville, O., and conveying and elevating machinery to Greenville Silica Sand and Quarry Co., Greenville, Pa.

Cast Steel for Locomotive Cylinders.—Cast steel is being used in a field which was formerly filled exclusively by cast iron; namely, the construction of locomotive cylinders and saddles. The Penn Steel Casting & Machine Co., of Chester, Pa., recently cast and finished several steel cylinders for the New York Central Railroad. One of the advantages found in these cylinders was that thinner sections could be used than in cylinders made from cast iron.

Bessie furnace, operated by the Bessie Ferro-Silicon Iron Co., Columbus, O., is out of blast for relining.

MINES LONG IDLE

Have been Leased by M. A. Hanna & Co. and will be Operated.

Ishpeming, Mich., Feb. 19.—M. A. Hanna & Co. have secured a lease of the American and Boston mines, eight miles west of Ishpeming, and preparations are being made for a resumption of operations at the former. The American has been idle fourteen years, while the Boston has not been wrought in about twenty years. The former operators of the American were Ishpeming and Wisconsin men, who were forced to abandon the property because of insufficient capital to operate it with a profit. During its idle period all the mine buildings have been torn down and the machinery destroyed and carried away. The machinery in use at the East New York mine, which Hanna & Co. operated for five years up to last November, is being removed and will be installed at the American. The property produces ore of high grade, some of it assaying 57 per cent in iron besides being low in phosphorus. Mining men familiar with the formations on the range predict a future for both the American and Boston, as there was a good showing of ore in both mines when they were closed down. The shaft on the American is about 600 feet deep, but will be extended several hundred feet in the hope that larger ore bodies than those near surface will be found. The Boston shaft is 300 feet deep. Captain Frank Platto, former superintendent of the East New York mine, will have charge of the properties.

A prominent mining corporation operating in the field is also endeavoring to procure a lease of the Dexter and Dey mines, owned by the Dexter Consolidated Mining Co., and located two miles east of the American and Boston. P. P. Chase, one of the fee owners, has been in Detroit during the week trying to secure the consent of the majority stockholders to the proposition the mining corporation has made him. Mr. Chase and others familiar with the underground workings of the Dexter claim that there is a large body of ore in sight. The Dexter has been idle fourteen years, but the machinery and mine buildings are in good condition. The Dexter shaft is 700 feet deep and the Dey shaft is 300. It is believed that by sinking a few hundred feet larger ore bodies will be encountered. The parties negotiating for the property would sink the shafts deeper and diamond drills would be used to explore from surface. The formations at the Dexter indicate a condition similar to that obtained at the Champion, which is the deepest mine in the county. Before the Champion was 1,000 feet deep, it was generally supposed that the mine would last but a few years, but with depth the deposits began to increase in size. The Champion is on the same range, about six miles west. The Oliver Iron Mining Co. is overhauling the machinery at the Champion at an outlay of about $100,000. The mine has been idle since two years ago last October, though it is generally thought that operations will be resumed before the close of the present year. When the mine closed there were about 300,000 tons of ore in stock, nearly one half of which has been shipped since the Steel Corporation took possession. Last year 64,680 tons were shipped.

Contract for New Mills.—The Lockhart Iron & Steel Co., McKees Rocks, Pa., has let a contract to the Mesta Machine Co., Pittsburg, for a new 16-inch mill with two stands of rolls and a 12-inch mill with five stands of rolls for the new Belgian mills, to be ready for operation about the middle of the year.

The Allis-Chalmers Co., Milwaukee, has recently created a separate department for the manufacture of gas engines. The chief engineer of the department is E. T. Adams, and the intention is to manufacture only large units running into the thousands of horsepower. The type of the engine to be built was developed in Germany, but a number of alterations have been made to adopt it to American uses. Especial attention will be given to motors intended for use with blast furnace gases.

Suit Again Won.—The Wheeling Mold & Foundry Co., Wheeling, W. Va., has again won its case against the Wheeling Iron & Steel Co., in the circuit court of West Virginia and the case will be carried to the supreme court. The suit was for recovery on an alleged breach of contract. The Wheeling Mold & Foundry Co., entered into a contract with the Wheeling Steel & Iron Co., to furnish it with certain castings, the latter company to furnish part of the material for the work. During the trial the Wheeling Steel & Iron Co., alleged it was for some reason unable to furnish the material and in this manner delayed the delivery of the work by the Wheeling Mold & Foundry Co. When final delivery was made the Wheeling Steel & Iron Co. proceeded to enforce the contract which stipulated that for each day the work was delayed after the specified time a certain amount was to be deducted. The Wheeling Mold & Foundry Co., believing that on account of the other company causing the delay it should not be compelled to pay the forfeit and sued to recover the amount retained. The first trial resulted in a verdict of $12,298.93 with interest and the second verdict was the same without interest being allowed.

LATE RAIL SALES.

(Special Telegram.)

New York, Feb. 21.—Among the rail sales announced are these: Wabash, 5,000; Tonopah, 3,600; Western Carolina, 3,000; small orders about 12,000, largely from trolley lines.

The International Power Co. has recently been awarded contracts for two large Diesel internal combustion engines. The largest, which is said to be the most powerful engine of this kind thus far built, is to go to the Pittsfield, Mass., Electric Light & Power Co. The other is designed for similar purposes and is for the equipment of the Laconia, N. H. electric light plant.

The N. & G. Taylor Co., operating the mills of the Maryland Sheet & Steel Co., at Cumberland, Md., has completed the installation of new continuous heating furnaces, conveyors, roll train and hot beds for the manufacture of light steel billets in the sections running from 1½ to 3¼ inches. This plant will be in operation by the end of the month, rolling a special grade of soft basic open-hearth steel.

The Vulcan Foundry & Machine Co., New Castle, Pa., with main office at Pittsburg, will resume operations next Monday, starting the foundry first and the machine shop in two or three weeks. The company is in line to contract for all kinds of heavy mill machinery and special designs of all kinds. The plant has been idle for about nine months.

The American Steel Tie Co. was incorporated last week in New Jersey with a capital stock of $1,000,000, to manufacture railway ties of steel or of steel and asphalt or combination filling. The registered office is in the building of the Pennsylvania Railroad at No. 12 Exchange Place, Jersey City, N. J. The incorporators are: John G. Snyder, of Altoona, Pa.; William M. Davis, of New York and George M. Osgoodby, Montclair, N. J.

The Passaic Steel Co., Paterson, N. J., has secured the contract for the structural steel framework, amounting to about 1,000 tons, for the new building at 718-20 Broadway, New York. R. H. McDonald & Co. are the general contractors in charge.

"W. P. SNYDER" LAUNCHED

Under Auspicious Conditions at Ecorse Yard.—Will Carry Iron Ore.

Another link has been made in the great chain which is being forged to connect the iron-making industry of the country with the sources of its raw material. One of the characteristic features of the past two or three years has been the disposition of the great steel-making companies to control the avenues of transportation leading from their mines to their furnaces. This policy has resulted in the placing of a number of orders for freighters with lake ship yards. The latest vessel of this class to be launched is the "Wm. P. Snyder" which went overboard at the Ecorse yard of the Great Lakes

MISS MARY B. DYER.

Engineering Works of Detroit on Saturday last. This steamer is building for the Shenango Steamship Co. of Cleveland and is intended to carry the ore of the Shenango, Webb and Whiteside mines, owned and operated by the Shenango Furnace Co. This new steamer is one of the largest on the lakes, being 550 feet over all, 530 feet keel, 56 feet beam and 31 feet deep. She has thirty-three hatches, spaced 12 feet centers. Her engine is triple-expansion with cylinders 23, 37 and 63 inch diameters by 42 inch stroke, supplied with steam from two Scotch boilers 15 feet by 12 feet, with induced draft and allowed 175 pounds pressure. The steamer will carry 10,000 gross tons of ore.

The launch was successful in every way. The launching party left on a special car and had luncheon enroute to the ship yard. The steamer was christened by Miss Mary B. Dyer of Pittsburg, daughter of Mr. C. B. Dyer, secretary of the Shenango Steamship Co. Mr. Wm. P. Snyder, after whom the vessel is named, was unable to be present as he is in the south with his family. Those in the launching party included the following: From Pittsburg, Charles H. McKee; C. H. Hayes, vice president Pittsburg Trust Co.; Henry Irwin, Jr., treasurer Shenango Furnace Co.; C. D. Dyer, vice president Shenango Furnace Co.; W. A. Barrows Jr., general manager Shenango Furnace Co.; A. W. Renwick, O. P. Scaife Jr., S. C. Irwin, Mrs. Dyer, Mrs. Renwick, Mrs. Barrows, Mrs. Irwin, Mrs. H. D. Rankin, Miss Christine Beale, Miss Mary B. Dyer. From Cleveland: R. P. Ranney, W. B. Davock, H. M. Herriman, Ralph D. Mitchell, Capt. Henry Peterson, Mrs. Ranney, Mrs. Davock. From Detroit: George H. Russel, H. C. Potter Jr., H. P. Davock, L. C. Waldo, Alexander K. Gage, Harlow N. Davock, Clarence W. Davock, Antonio C. Pessano, John R. Russel, Mrs. Russel, Mrs. Davock, Mrs. Waldo and daughters, Mary and Louise, Mrs. Gage. From Ypsilanti: Miss Nan Olmstead. Prof. H. C. Sadler of the University of Michigan embraced the opportunity to attend the launch with about thirty students in his class in marine engineering and naval architecture.

In the evening the launching party went to the theater after which they were tendered a supper by the steamship company at the Cadillac hotel.

Money will not be spared to make the Snyder in respect to interior furnishings one of the most elegant freighters on the lakes, Mr. Snyder having personally made a donation for this purpose. The new steamer will be sailed by Capt. Henry Peterson, one of the most competent masters on the lakes.

WIDER SCOPE

Than at First Proposed for Western Bar Iron Association.

The plans of the new Western Bar Iron Association recently organized in Chicago, and of which Mr. James H. Nutt, of Youngstown, O., formerly labor commissioner for the Republic Iron & Steel Co., was elected secretary, have not been entirely completed, but their scope will probably be wider then at first expected. Heretofore the various independent bar iron manufacturers have always followed in the footsteps of the Republic Iron & Steel Co., and accepted whatever scale it agreed upon with the Amalgamated Association of Iron, Steel and Tin Workers.

With the natural tendency of the larger interests within the past half dozen years to devote their attentions more to steel than to iron, the manufacturers represented at this Chicago meeting and who are now members of the new Western Bar Iron Association felt they had not had an opportunity to present their individual claims when the question of wage scales came up for consideration, and that by their new association they will, by asking for a conference with the Amalgamated Association, be in a position to call attention to local conditions surrounding the individual mills. this being impossible except by getting together as an association. The mills now represented which will ask for a conference with the Amalgamated are as follows: Union Rolling Mill Co., Lake Erie Iron & Steel Co., and Empire Rolling Mill Co., of Cleveland; American Car & Foundry Co., Detroit; Helmbacher Rolling Mill Co. of St. Louis, Mo.

JAMES H. NUTT.

and Madison, Ill.; Ohio Falls Iron Co. of New Albany, Ind.; Highland Iron & Steel Co. of Terre Haute, Ind.; Vincennes Iron & Steel Co., Vincennes, Ind.; Inter State Iron & Steel Co., East Chicago, Ill.; American Rolling Mill Co. of Munic, Ind., and the Fort Wayne Iron & Steel Co., of Fort Wayne, Ind. Other companies will come in later. Together those already members employ over 10,000 workers and represent the most important iron mills in the west.

Mr. Hill's Statement.—Concerning the numerous newspaper stories current in regard to his reported ore land deal, Jams J. Hill made the following statement on his return from the south: "I would not be adhering to the facts if I should tell you that a large holding company was formed to take over the ore lands and lease them to the Steel Corporation or that it was decided to distribute the holding company stock among Great Northern stockholders."

GREAT RECORD FOR 1905 OF THE LAKE SUPERIOR IRON RANGES.

From figures received directly from the mining companies, railroads and selling agents, THE IRON TRADE REVIEW has compiled its annual statistics of iron ore shipments mine by mine from the Lake Superior region in 1905. The total is 34,353,456 gross tons, compared with 21,822,839 tons in 1904, 24,289,878 tons in 1903, 27,571,121 tons in 1902, 20,593,537 tons in 1901 and 19,059,393 tons in 1900. The increase is 24 per cent over the record year of 1902. The shipments by water last year were 33,476,904 tons and by rail to upper lake furnaces and to South Chicago, Milwaukee and Colorado, 876,552 tons. The all-rail shipments were 596,175 tons in 1904, 640,328 tons in 1903, 531,952 tons in 1902 and 436,015 tons in 1901. The total of shipments from Lake Superior in 1905, as given below, does not include 169,527 tons shipped from the Helen mine in Ontario belonging to the Lake Superior Corporation. Of the Helen tonnage 104,266 tons was shipped to the United States.

Although the great importance of the Mesabi range is again shown by the figures for 1905, the old ranges do not lag far behind in their proportionate shipments. The Mesabi shipments were 20,153,699 tons against 12,156,008 tons in 1904 and 13,342,840 in the record year of 1902. The Mesabi percentage of the total shipments is this year 58.66 against 55.7 in 1904, 53 per cent in 1903 and 48 per cent in 1902. The Mesabi added seven new shipping mines in 1904 and nine last year, the most remarkable addition for 1905 being that of the Morris mine, which in its first year shipped 1,070,937 tons, a record unprecedented in mining history. The United States Steel Corporation drew on the Mesabi and Vermillion ranges last year for 71 per cent of its shipments against 69 per cent in 1904.

The Steel Corporation's shipments last year were 18,783,221 tons, or 54.6 per cent of the whole. In 1904 the Corporation's shipments were 11,197,743 tons, or 51.3 per cent of the whole. In 1903 it shipped 13,485,597 tons or 55.5 per cent of the whole, and in 1902, 16,136,787 tons or 58.5 per cent of the whole. As explained in past years in these columns, the Steel Corporation's shipments of Lake Superior ores are not an entirely accurate index of the amount shipped to its plants year by year. Some deductions are to be made on account of ore shipped to other consumers and there are additions to be made of ore which the Steel Corporation receives from other producers.

The list of shipping mines in 1905 contains 143 names against 135 in 1904, 142 in 1903, 133 in 1902 and 104 in 1901. The distribution among the ranges is as follows: Marquette range, 21 against 20 in 1904; Menominee, 31 against 30 in 1904; Gogebic, 20 against 22 in 1904; Vermillion, 6, the same as in 1904; Mesabi, 65 against 55 in 1904. The Cleveland Cliffs group consists of Moro, Cliffs Shaft, Lake Salisbury, Ogden, Austin and Michigamme. The Hull, Burt and Rust mines on the Mesabi range, heretofore reported as the Lake Superior group, are given this year under their own names. On the Gogebic range the Norrie, East Norrie, Aurora and Pabst are reported as one, under the Norrie group.

In 1901 the Stevenson mine was preeminent on the producing column with a total of 1,652,021 tons. In 1905, it steps into third place, Mountain Iron being at the head of the list with 2,495,089 tons to its credit, while the Burt comes second with 1,860,452 tons and the Stevenson third with 1,428,614 tons. In 1904 there were only two mines which mined more than 1,000,000 tons, while in 1905 there were seven which mined more than 1,000,000 tons each and one which mined more than 2,000,000 tons. Previous to 1905 the record for the largest production by a single mine in any year was held by the Fayal, which produced 1,919,172 tons in 1902. The shipments by ranges and by mines in 1905 were as follows:

GOGEBIC RANGE.

Mine.	Gross tons. 1905.
Anvil	82,118
Ashland	409,131
Atlantic	208,039
Brotherton	137,351
Cary	146,414
Colby	83,736
Harmony	2,973
Hennepin	2,589
Ironton	41,314
Mikado	140,740
Montreal	107,854
Newport	438,023
Norrie Group	1,527,128
Ottawa	21,986
Palms	13,953
Pike	11,161
Sunday Lake	79,209
Tilden	188,104
Wisconsin (New Davis)	3,160
Yale	60,224
Total	3,705,207

VERMILLION RANGE.

Mine.	Gross tons. 1905.
Chandler	365,739
Pioneer	653,682
Savoy	91,775
Sibley	251,170
Soudan	205,002
Zenith	109,818
Total	1,677,186

MENOMINEE RANGE.

Mine.	Gross tons. 1905.
Antoine	138,395
Appleton	1,819
Aragon	423,698
Baltic	133,246
Breen	16,625
Bristol	210,388
Caspian	10,248
Chapin	902,628
Columbia	27,883
Commonwealth	8,085
Crystal Falls	152,255
Dunn	21,051
Florence	233,858
Genesee	77,370
Great Western	191,265
Hemlock	124,450
Hiawatha	9,704
Lamont	74,991
Lincoln	19,539
Loretto	118,738
Mansfield	38,584
Michigan	58,088
Munro	92,183
Nanaimo	91,238
Paint River	11,973
Penn Iron Mining Co.	423,244
Pewabic	533,413
Riverton	82,611
Tobin	166,529
Vivian	90,426
Youngs	10,926
Total	4,495,451

MARQUETTE RANGE.

Mine.	Gross tons. 1905.
Beaufort	38,306
Bessie	21,879
Cambria	81,791
Champion	64,680
Chester	23,766
Cleveland Cliffs Group	1,288,416
East New York	33,095
Foxdale	3,303
Hartford	322,209
Imperial	1,661
Jackson	33,130
Lake Angeline	374,183
Lake Superior	727,378
Lillie	9,868
Mary Charlotte	221,738
Negaunee	239,554
Princeton	129,079
Queen	253,377
Republic	150,699
Richmond	86,129
Volunteer	106,281
Total	4,210,522

MESABI RANGE.

Mine.	Gross tons. 1905.
Adams	1,140,984
Agnew	44,651
Ajax (Kanawha)	28,439
Albany	241,186
Alexander	15,073
Bessemer	112,630
Biwabik	1,092,987
Burt	1,860,452
Cass	59,552
Chisholm	231,296
Cincinnati	965
Clark	358,091
Columbia	1,360
Commodore	146,901
Croxton	130,228
Cyprus	235,351
Duluth	142,172
Elba	125,724
Fayal	1,358,922
Forest	99,785
Frantz	70,210
Genoa	281,081
Glen	287,835
Grant	49,227
Hawkins	202,070
Hector (Hale)	4,990
Higgins	238,598
Holland	158,484
Hull	233,065
Iroquois	61,109
Jordan	185,854
Kinney	89,161
La Belle	78,597
La Rue	197,192
Laura	27,207
Leetonia	352,004
Leonard	297,011
Lincoln	275,777
Longyear	16,778
Mahoning	1,011,661
Malta	139,853
Miller	113,520
Minorca	117,653
Monroe	13,730
Morris	1,070,937
Morrow	60,752
Mountain Iron	2,495,089
Myers	188,568
Pettit	140,239
Pillsbury	161,924
Rust	272,114
Sellers	261,501
Shenango	213,097
Sparta	27,777
Spruce	606,295
St. Clair	61,792
Stephens	367,764
Stevenson	1,428,614
Tener	58,136
Troy	87,584
Utica	185,944
Virginia (Oliver)	402,224
Webb	71,235
Wills	4,550
Yates	58,174
Total	20,153,699

MISCELLANEOUS. (IN WISCONSIN)

Iron Ridge	39,978
Illinois	71,413
Total	111,391
Grand total	34,353,456

In the following tables the shipments are given by ranges and by ports and all rail:

SHIPMENTS BY RANGES, GROSS TONS.

	1905	1904	1903	1902	1901
Marquette Range	4,210,522	2,843,703	3,040,245	3,868,025	3,245,346
Menominee Range	4,495,451	3,074,848	3,749,567	4,612,509	3,619,083
Gogebic Range	3,705,207	2,398,287	2,912,912	3,663,484	2,938,155
Vermillion Range	1,677,186	1,282,513	1,676,699	2,084,263	1,786,063
Mesabi Range	20,153,699	12,156,008	12,892,542	12,342,840	9,004,890
Miscellaneous	111,391	67,480	17,913	.....	.....
Total	34,353,456	21,822,839	24,289,878	27,571,121	20,593,537

SHIPMENTS BY PORTS AND ALL-RAIL, GROSS TONS.

	1905	1904	1903	1902	1901
Escanaba	5,307,938	3,644,267	4,277,561	5,413,704	4,022,668
Marquette	2,977,828	1,907,301	2,007,346	2,595,010	2,354,284
Ashland	3,485,344	2,288,400	2,823,119	3,553,919	2,886,252
Two Harbors	7,779,850	4,566,542	5,120,656	5,605,185	5,018,197
Gladstone	.....	553	85,816	92,375	117,089
Superior	5,118,385	4,169,990	3,978,579	4,180,568	2,321,077
Duluth	8,807,559	4,649,611	5,356,473	5,598,408	3,437,955
Total by lake	33,476,904	21,226,664	23,649,550	27,039,169	20,157,522
Total by rail	876,552	596,175	640,328	531,952	436,015
Total shipments	34,353,456	21,822,839	24,289,878	27,571,121	20,593,537

PERSONALS.

E. C. Crowther has resigned as superintendent of blast furnaces at the La Belle Iron Works, the resignation to take effect March 1.

J. P. Morgan sailed from New York on the White Star Line steamship Celtic on Saturday, February 17, for his annual trip abroad.

Fred E. Lee, manager of the Beckwith estate, Dowagiac, Mich., sailed two weeks ago for Cairo, Egypt. He will be abroad several weeks.

C. E. Haydock and St. George B. Tucker have been chosen directors of the Herring-Hall-Marvin Safe Co., to succeed R. T. Pullen and L. D. York, resigned.

Carl H. Peterson, sales agent of the Pressed Steel Car Co., with headquarters at Chicago, has taken a similar position with the Chicago office of the Standard Steel Works.

B. D. Quarrie, superintendent of furnaces of the Cleveland Furnace Co., has resigned to assume the position of assistant superintendent of furnaces with the American Steel & Wire Co., Cleveland.

Howard McLean, formerly general superintendent of the Link Belt Machinery Co., Chicago, is now associated with H. W. Caldwell & Son, of that city, in the capacity of consulting engineer.

M. R. Nyman has been appointed manager of the Chicago office of the Buffalo Forge Co. and the Buffalo Steam Pump Co. He was formerly connected with the Electric Appliance Co., Chicago.

C. W. Streckenbach has acquired the interests of Fred B. Warren, in the Western Steel & Iron Works, De Pere, Wis., and will become active in the concern in the capacity of secretary and treasurer.

Edwin R. Kent, of Edwin R. Kent & Co., 10 South Canal street, Chicago, manufacturers of tool steel, was stricken with a severe illness at his office Friday, Feb. 16, and had to be conveyed home in a carriage.

O. A. Blackburn, who has resigned as sales agent of the Monongahela River Consolidated Coal & Coke Co., to devote his attention to the Sharon Steel Hoop Co., Sharon, Pa., has been succeeded by Benjamin S. Hammill.

J. H. Sheadle, secretary of the Cleveland Cliffs Iron Co., Cleveland, is to be honored by having his name given to one of the steel freighters now being built for that company at the plant of the Great Lakes Engineering Works.

E. E. Wood is to become general manager of the business of George T. Walcott & Son, Jackson, Mich., machinery manufacturers. He has been engaged as special sales agent for the Niles-Bement-Pond Co. and the Pratt & Whitney Co.

Ray S. Fox, for some years a traveling salesman of the Columbus Iron & Steel Co., Columbus, O., has been appointed sales manager to succeed J. Clare Miller, who has become connected with the Domhoff & Joyce Co., Cincinnati.

H. E. Schild, general superintendent of the Montery Iron & Steel Co., Monterey, Mex., and O. Goldstein, superintendent of the steel works, have resigned. They have been succeeded by Henry Knoth as manager of the steel works, with Reinhardt Daae as assistant.

The Reading Iron Co. has elected directors as follows: George F. Baer, chairman of the board, Joseph S. Harris, F. C. Smink, Samuel Seyfert and Frank L. Connard, directors. F. C. Smink was elected president, Frederick Buller, treasurer, and George W. Delany, secretary.

Carr H. Bowlby, of Waynesburg, Pa., has been elected president of the Waynesburg Forge, Sheet & Tin Mills, succeeding W. H. Griffith, who has disposed of his interests in the concern. W. H. Baker has resumed the duties of general manager, which position he resigned a year and a half ago.

Thomas E. Evans, for some time superintendent of the Lower mills of the Carnegie Steel Co., Pittsburg, has resigned to accept a position with the Western Steel Co., Pottsville, Pa. He was at one time superintendent of the plate mill of the Republic Iron & Steel Co., at Pittsburg, and has been with the Carnegie Co. for the past 12 years.

John P. Elton, treasurer of the American Brass Co., and an officer in other important manufacturing industries, has been elected president of Blake & Johnson, Inc., Waterbury, Conn. Robert P. Lewis, secretary of the company for some years, has been made secretary and treasurer. These changes were occasioned by the recent death of R. R. Stannard, president and treasurer of the company.

Marcus C. Steese, superintendent of the blast furnace of the Brier Hill Iron & Coal Co., on March 1, will assume charge of the furnace department of the La Belle Iron Co., Steubenville. He will be succeeded by Peter Brannon, at present chemist of the Brier Hill company.

James Gayley, of New York, first vice president of the United States Steel Corporation, will deliver the address before the graduating class of the Michigan School of Mines, May 4.

J. E. Hubbert, formerly connected as salesman with the Chicago office of the American Sheet and Tin Plate Co., has been appointed as manager of the Chicago office of the Republic Iron and Steel Co. Mr. Hubbert has been identified with the iron and steel business for a great many years, having formerly been vice president of the Corning Steel Co., Hammond, Ind., which was absorbed by the American Sheet Steel Co. at the time of the latter's organization, and later with the firm of Hubbert & Hubbert, Chicago, iron and steel commission merchants. The Republic Iron and Steel Co. will retain part of its present suite of offices as headquarters for the local branch when the other departments are moved to Pittsburg. No changes in the Chicago sales force will be made, other than that Ralph Zint, the assistant general sales agent, will be transferred to Pittsburg.

OBITUARY.

Jerome C. Taft, president of the Taft Machine Co., Providence, R. I., died suddenly Feb. 8. He was an inventor of a number of successful machines.

M. D. McElwee of Rankin, Pa., for many years one of the heads of departments at the Carrie furnaces of the Carnegie Steel Co., died Feb. 15 from pneumonia. He was 47 years of age.

Robert Kerper, proprietor of the Boonville Foundry & Machine Works, Bloomville, Mo., was found dead Feb. 10 with his head fastened between two fence pickets. It is supposed he was stricken with apoplexy and fell.

Hugh Darsie Smith, who was treasurer of the La Belle Steel Co. until its merger with the Crucible Steel Co., died Feb. 11 at his home near Seneca Falls, N. Y. Frank B. Smith, president of the Crucible Steel Co., is a brother.

F. R. Avery, treasurer of the Avery Mfg. Co., Peoria, Ill., committed suicide, Feb. 13, near Centerville, Ill. In a note which he left addressed to the directors of the company he resigned as treasurer and director. His accounts were found absolutely accurate.

E. H. Wilson, well known in the iron business of Philadelphia, died in that city Feb. 11 at the age of 55. For many years, in connection with J. B. M. Hirons and A. V. Kaiser, he engaged in the iron trade in Philadelphia. In 1894 Mr. Kaiser withdrew, and the business was continued under the name of E. H. Wilson & Co.

MOTOR-DRIVING AND MACHINE SHOP ECONOMY.[1]

BY E. R. DOUGLAS.[2]

A few years ago the question of motor-driving was considered entirely on the basis of saving in power. It is undeniable that the loss in transmitting power electrically, except for short distances is less than with mechanical transmission, especially as amounts of power become large, and when the driven units are few and large, the first cost of motors and wiring may be no greater than the cost of shafting and hangers.

Applications of motors for the driving of factories were at first confined to the class known as group-driving, in which a few good sized motors drive independent short lengths of line shafting, to each of which a group of machines is connected by means of belts and countershafts. The driving of machines individually, by motors, came slowly.

In machine shops the first application was on tools under traveling cranes, where the absence of belts and overhead work was an obvious advantage. It was not until this stage had been reached that the principal advantages of the motor drive even began to be apparent. Those first disclosed were: (a) Clear overhead room for crane service. (b) Better light and ventilation, since unobstructed by shafts and belts. (c) Absence of dirt and grease thrown about by moving belts. (d) Reduced fire risk from dusty, oily moving belts. (e) Cost of repairs and upkeep on hanger-boxes, belts and countershafts eliminated. (f) Greater flexibility of shop arrangement and location of machines where most convenient. (g) Convenience of motors for driving auxiliaries, moving heavy parts of machines and operating extra cutting tools on special jobs. (h) Entire absence of power loss when machines are not in operation.

As these became apparent, the individual drive increased in favor and was applied on smaller and less important machines, The advantages were generally found to have justified such action.

It, however, required a combination of two improvements, directly affecting production, to bring about the great change from belt driving. These were the introduction of high speed steel for cutting tools, and the development of commercially practical variable-speed motors These led to an appreciation of the importance of the labor element in manufacturing operations, and carefully worked out systems for determining that and other elements of cost were devised. To show the importance of the labor element, the accompanying table gives an analysis of the shop costs of an article manufactured in two differing sets of conditions. The cases are hypothetical but are also typical.

TABLE I.—TOTAL SHOP COSTS.

	Belt driv'g.	Electric driv'g.
Material	$0.50	$0.50
Direct labor	0.30	0.273
Indirect labor	0.10	0.091
Power	0.02	0.02
Supplies, repairs, maintenance	0.03	0.027
Interest and depreciation on plant	0.04	0.036
Insurance, taxes, etc	0.01	0.009
Total	$1.00	$0.956

The subdivisions might be made more complete, but there would be no advantage for the present discussion. The apportionment of shop costs among the different items of the table vary considerably among establishments working on different lines, and particularly would variations in amounts for material and labor be met.

One of the most important improvements affecting the use of the motor-drive has been the introduction of high speed tool steels. Their introduction caused a great many changes in machine shop practice, as it permitted an increase in cutting speeds ranging from 100 to 500 per cent, with a corresponding gain in rapidity of production. While this is accompanied by an increase in the power required to drive the tools the total cost of power to complete a given job will not be greatly affected, as although the power requirement is greater, the time required is less.

When it was attempted to use such steels at their highest speeds on machine tools of ordinary designs, these tools speedily developed weaknesses, made apparent by breaking down and by excessive vibration. The general line of metal working machinery has had to be largely re-designed, in order that the machinist may avail himself of the highest speeds now possible.

The steels formerly standard were not as a rule used up to their limit of capacity, owing to a lack of knowledge on the part of the workman as to what he could do, or inattention on the part of the foreman, if he had the knowledge, and general indifference to the details of rapid production. The advent of the new steels called attention to this laxness, and to the need of taking complete advantage of the new situation, as in many cases the machine operator is not skilled in judging cutting speeds, and in this case it has become necessary to have these speeds determined for him by some one else, as a speed boss.

When such a man attempts to specify the most advantageous cutting speed for a given job on a lathe of the ordinary belt driven type he often finds that the speed wanted is not always obtainable. Take, for instance, the ordinary engine lathe; the steps given by the cones and back gears differ very much from each other, varying as much as 50 or 60 per cent. If 100 feet per minute were desired on a job, it might be found that the nearest speeds the lathe would give would be 75 to 120 feet per minute. The latter would probably be so high as to require regrinding the cutting tool in too short a time. The former would mean an increase of 33 per cent in the time of machining. The lower speed has been the alternative chosen in many such instances, but the cause is apparent of the demand for a closer gradation of speed steps.

Another difficulty in the way of rapid production with belt driven tools comes from the inconvenience of changing speeds by the means usually provided. To do this requires that the workman shift the belt, and possibly change the back gear; the former may be done while the machine is in motion, but for the latter it must be shut down temporarily.

Having grasped the ideas preceding the advent of the variable-speed motor and particularly the limitation of the belt driven tool, it is necessary to consider the methods of proper speed control, and the results they produce. The systems in use are respectively known as one-wire, two-wire, three-wire and four-wire systems.

The two-wire system makes use of a single voltage, and a motor, capable of large speed variation by means of field regulation. Until recently it was not found practical to make a variation in speed of more than 30 per cent in this manner. Improvements in motors now permit of speed ranges of 2 to 1 or 3 to 1, and in some cases the speed limitations are as large as 6 to 1, with fairly satisfactory results. The size of motors required for these ranges become, however, too great as compared with the size of constant speed motors of the same output, or even as compared with the variable-speed motors of the three and four-wire systems.

The most common three-wire system makes use of 230 volts between mains and 115 volts between each main and the neutral. The increase by field regulation necessary to bridge the gap between them is nearly 100 per cent, and the same increase is usually made above the 230 volt speed as well. The total range then becomes 4 to 1. The three-wire system is also used with un-

[1] Abstracted from *The Electrical Review*, Feb 10, 1906.

[2] Chief draftsman, Crocker-Wheeler Co., Ampere, N. J.

even voltages, as for instance, 77 and 153 respectively, between the neutral and outside wires, the main voltage being 230. With this arrangement a 6 to 1 speed range is possible.

When four wires are employed, the

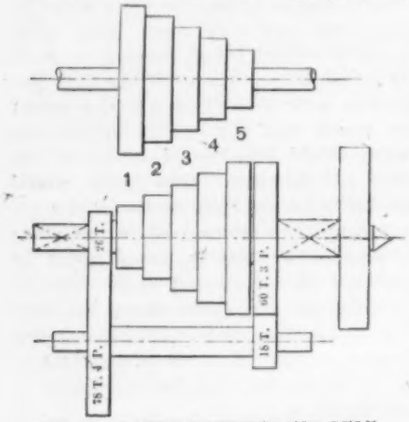


FIG. 1.—LATHE EQUIPPED FOR BELT DRIVE.

system becomes technically known as a multi-voltage system. Call the wires *a, b, c,* and *d;* the voltages between these wires in the order named may be 60, 80 and 110, giving a total voltage between *a* and *d* of 250. Voltages may also be obtained between the wires *ac* and *bd,* making the total series as given in table II.

TABLE II.—GEOMETRICAL VOLTAGES.

Wires	Volts	Ratios	Ratios to 250 Volts
ab	60	....	0.24
bc	80	1.38	0.32
cd	110	1.37	0.44
ac	140	1.27	0.56
bd	190	1.36	0.76
ad	250	1.32	1.0

This is practically a geometrical series of voltages.

If the voltages between wires *a, b, c* and *d* are 40, 120 and 80, the total series of voltages in this case is as in table III, the system here being arithmetical.

TABLE III.—ARITHMETICAL VOLTAGES.

Wires	Volts	Differences	Ratios to 240 Volts
ab	40	..	0.166
cd	80	40	0.333
bc	120	40	0.5
ac	160	40	0.666
bd	200	40	0.833
ad	240	40	1.0

On either of these systems field regulation is used to obtain intermediate speeds between the voltages and additional speeds above the highest. By either system large ranges even as high as 10 to 1 can be covered in the motor with a minimum of motor capacity. The wisdom of obtaining such wide ranges as 4, 6 or 10 to 1 on any system, entirely in the motor at full power, is doubtful. Practice seems to indicate that since a number of mechanical changes to multiply the motor's range are required in the majority of cases of tool equipment, the most economical plan will make use of a motor whose average working range is not over 3 to 1 with the two, three or four changes in gearing which may be necessary in connection with it.

As an illustration, the benefits resulting from the motor equipment of an ordinary 30-inch back geared lathe can be considered. The speed requirements of such a lathe are:

1st. To cover the range in diameters of work which may be done on the lathe, which may be from the smallest up to 30 inches.

2nd. To cover a range in cutting speeds required for different kinds of cuts, and for materials of different hardnesses, which may be worked on the lathe.

The formula used is

$$\text{Horsepower} = VSK$$

V is the amount of metal removed in cubic inches per minute, S the cutting speed in feet per minute and K a constant depending upon the material, being 0.25 to 0.4 for cast iron and 0.4 to 1 for steel. To the horsepower at the tool must be added the power to

TABLE FOR FIG. 1.

Belt on cone step.....	5	4	3	2	1
Spindle speed—Back-geared	7	11	17	28	44
Spindle speed—Direct.	70	110	170	280	440

overcome the friction of the machine. These constants are applicable to cutting tools similar to those used in lathes and planers, but do not apply to milling cutters where the rubbing friction between the tool and surface cut increases the power requirements greatly.

Suppose that on the 30-inch lathe to be considered 120 feet per minute is the maximum speed for soft machine steel on finishing cuts, and that for roughing cuts 60 feet per minute is the fastest that can be used. It is convenient to have speeds down to 30 feet per minute, making the range thus far obtained 120 to 30 feet per minute or 4 to 1.

A speed of 120 feet per minute corresponds to 153 revolutions per minute. The highest speed possible is about 500 revolutions per minute, and corresponds to 120 feet per minute on about a 9-inch diameter. The speed range covers variations of diameters as therefore from 500 to 15.3 revolutions per minute or about 33 to 1. The total range would be the product of the two, namely, 4 times 33 or 133 to 1. The maximum speed being 500, the minimum would thus be about 4 revolutions per minute.

Fig. 1 and its accompanying table

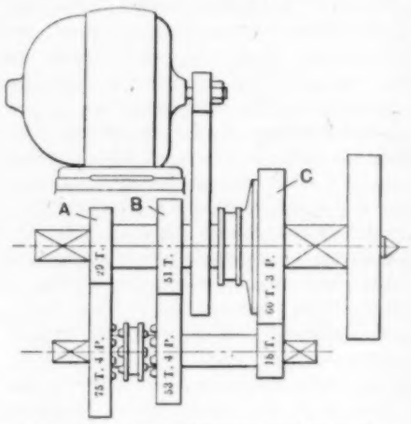


FIG. 2.—LATH EQUIPPED FOR MOTOR DRIVE.

show how well the ordinary belted lathe meets these requirements, and represent fairly accurately the equipment usual on such a lathe. The total number of speeds is 10, and the range is limited slightly on the upper end and considerably on the lower. The slowest speed actually corresponds to 55 feet per minute on 30 inches diameter. The method of equipping this lathe for motor-drive is shown in Fig. 2 and the speeds are as in the table accompanying it. The system of driving is the multiple voltage, with a motor, which at normal speed and voltage, gives 10 horsepower. The controller with the motor gives 22 speeds, from 85 revolutions to 1,200 revolutions per minute, and horsepower varying from 1.6 to 10 through this range as shown in the table. The single back gear of the belted equip-

TABLE FOR FIG. 2.

Voltage.	Controller.	Per Cent Field.	Motor Speed.	Motor Power.	Spindle Speed. A	Spindle Speed. B	Spindle Speed. C
40	1	0	85	1.6	4.1	10.2	35
	2	30	110		5.3	13.2	46
	3	70	145		7.0	17.4	60
	4	0	225		10.9	27.0	94
80	5	10	250	4.0	12.1	30.1	104
	6	20	270		13.0	32.5	112
	7	30	290		14.0	35.0	121
	8	45	325		15.7	39.1	135
120	9	0	380	6.0	18.8	47.0	162
	10	10	430		20.8	51.7	179
	11	20	470		22.8	56.6	195
	12	30	510		24.6	61.6	212
	13	0	540		28.6	63.9	220
160	14	10	585	7.5	28.3	70.8	243
	15	20	635		30.6	76.5	264
200	16	0	670	9.0	32.3	80.8	278
	17	10	740		35.8	89.1	308
	18	0	825	10.0	39.9	99.2	343
240	19	10	910	10.0	44.0	109.0	378
	20	20	990	10.0	47.0	117.0	411
	21	30	1,070	9.0	51.6	129.0	446
	22	45	1,200	7.5	58.0	145.0	500

ment has been replaced by a double back gear and the direct speed is for convenience, controlled by a friction clutch. The two back gears speeds are also controlled by a clutch. The slowest speed will be referred to as gear run A, the intermediate speed as gear run B, and the fastest speed as C. 15 on B, 7½ horsepower at least is obtainable. From 15 to 21 on B, 10 horsepower is obtainable, and from 22 on B to 22 on C six horsepower at least can be obtained. These facts are illustrated diagramatically in Figs. 3 and 4, which show the horsepower with each diameter of swing at cutting tion assumed in column 2 is that the exact speed desired on any part can be obtained instantly. The total time required is 181.5 minutes. Columns 3 to 7 result when doing the work on the belted lathe, shown in Fig. 1. In column 3 it is assumed that in each different operation the speed used is

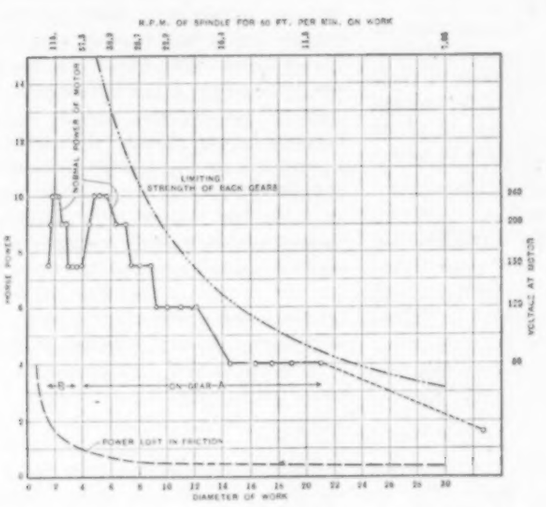


FIG. 3.—30 INCH LATHE—POWER CHART FOR 60 FEET PER MINUTE.

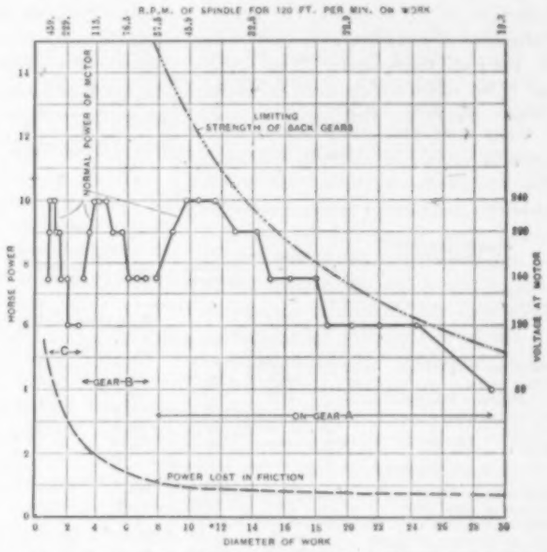


FIG. 4.—30 INCH LATHE—POWER CHART FOR 120 FEET PER MINUTE.

The clutches are of such a nature that they may be moved from one to another of these speeds, while the lathe is in motion. The ratios of speeds between these different runs of gearing are so arranged that with a motor running at 1,200 revolutions per minute, the standard speed, the gear A has 58 revolutions per minute, the gear B 145 revolutions, and C 500 revolutions. The other speeds obtained by the controller on each run of the gearings are set down in the table. It will be seen that starting with the slowest speed, position 1 on gear A, the series is continuous to position 22, 58 revolutions per minute.

The next position of the series begins on gear B at position 13, 63.9 revolutions per minute, and extends to position 22 on that gear, with 145 revolutions per minute. The third portion of the series on gear C begins at position 9 with 163 revolutions per minute, and extends to position 22 with 500 revolutions per minute, making a complete range of 4.1 to 500. The object of this choice of gear ratios and of the points at which the positions of the series start is to provide, on the different portions of the range of work which the range can swing, the amounts of power required on these portions with the most economical use of the motor's capacity. From position 4 on gear A to position 8, four horsepower is obtained. From position 9 to 12, six horsepower; from position 13 on A to speeds of approximately 60 to 120 feet per minute.

As a practical example we may consider the time required for taking certain roughing and finishing cuts from a shaft with a coupling end, as shown in Fig. 5. The forging is rough turned leaving 1-16 inch of metal to cut off. The cylindrical parts B, D, F and H are to be rough turned and then finished, working out the fillets. Face I is to be rough turned only, finishing cuts being taken after keyseating and grinding. The centers must be trued up before work can be done.

With the tool steel in use it is found that a roughing cut of 3-64-inch depth and ⅛-inch feed can be taken at 60 feet per minute, while the finishing cuts on the facing work are at ¼-inch feed and a speed 120 feet per minute. The table accompanying Fig. 5 shows the times required for carrying out and finishing the shaft under ideal and practical conditions. The ideal condition assumed in column 2 is that the exact speed desired on any part can be obtained instantly. The total time required is 181.5 minutes. Columns 3 to 7 result when doing the work on the belted lathe, shown in Fig. 1. In column 3 it is assumed that in each different operation the speed used is that nearest the ideal one. This requires 12 changes of speed, taking about thirty minutes to shift the belts and back gears with an average of 2½ minutes for each shift. The time required for turning is but little longer than that required for changing speed. In column 4 fewer changes of speed have been made, many of the shorter operations being done at slow speed rather than take the time to make the shifts. Column 5 shows the results obtained when the number of speeds,

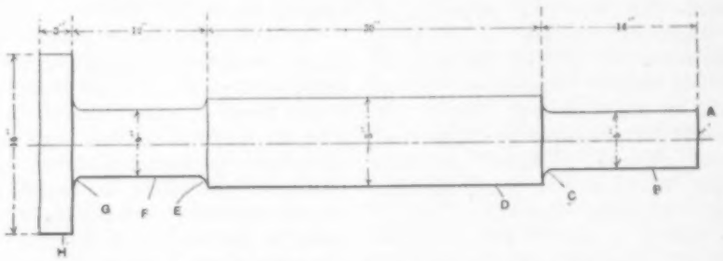


FIG. 5 —PIECE FOR ROUGH AND FINISHED TURNING.

which were 12 in column 3, and four in column 4, are reduced to two. But three minutes longer is required for the job than when done under the best conditions, as shown in 1. As there are few more changes in speed made than are necessary, the workmen are apt to use slow speed all through. Column 6 shows the results obtained by using but two changes of speeds, each one of them being one speed slower than the corresponding ones in

column 5. Column 7 is taken from actual practice.

In column 8 are shown the results obtained by the variable-speed drive. The time required in setting speeds when the lathe is so equipped is so slight that every speed called for by the ideal conditions may be met with advantage. The total time for making these changes is 2.4 minutes; the actual time required for turning is but one minute greater than under ideal conditions. The ratio which each of these total times bears to the ideal is also shown in the table, as well as the shop cost under each condition, assuming the labor to be worth 45 cents per hour, and the burden to cover shop expenses 90 cents per hour. Of course it must not be assumed that the mere installation of the motor drive will lead to the results as shown here. Pains must be at the same time taken to insure that it will be properly used.

1	2	3	4	5	6	7	8
Time Required for Operation.	Ideal.	Belted.					Motor Driven.
		All Speed Changes.	Best Time.	Probable Time.	Ordinary.	Bad.	
	Time Given in Minutes.						
Setting up, centering	75.0	75.0	75.0	75.0	109.5	...	75.0
Setting tools	34.0	34.0	34.0	34.0	42.5	...	34.0
No. of speed changes	(13)	(12)	(4)	(2)	(2)	...	(13)
Setting speeds	0	30.0	10.0	6.0	7.5	...	2.4
Turning	22.5	31.9	36.7	43.7	67.5	...	23.5
Gauging	50.0	50.0	50.0	50.0	62.0	...	50.0
Total time, minutes	181.5	220.9	205.7	208.7	289.0	...	184.9
Per cent of ideal time	100%	122%	113%	115%	159%	264%	102%
Total time, hours	3.03	3.69	3.43	3.48	4.82	8	3.08
Cost, at 45 cents per hour	$1.36	$1.66	$1.54	$1.57	$2.17	$3.60	$1.39
Burden, at 90 per cent	$1.22	$1.49	$1.39	$1.41	$1.95	$3.24	$1.25
Total labor cost	$2.58	$3.15	$2.93	$2.98	$4.12	$6.84	$2.64
Could be saved by motor drive	.....	.....	$0.19	$0.34	$1.46	$4.20	...
Saving in per cent of actual cost	.....	.....	6.7%	11.4%	35.4%	61.5%	...

Engineers' Society of Western Pennsylvania.—The following meetings of the Engineers' Society of Western Pennsylvania will be held during February and March: Thursday, Feb. 22, meeting of the Chemical Section. A paper will be presented on "The Constitution of the Bronzes" by Earl Blough. Tuesday, Feb. 27, a meeting of the Structural Section, at which there will be a topical discussion on "Erection Methods as Applied to Structural Steel Work," led by Willis Whited. Tuesday, March 6, a meeting of the Mechanical Section with a paper on "Mine Haulage" by W. B. Clarke. All meetings will be held at 410 Penn avenue, Pittsburg, and will be called to order at 8 p. m.

Spring Meeting of A. S. M. E.—The spring meeting of the American Society of Mechanical Engineers will be held in Chattanooga, Tenn., May 1 to 4.

THE APPLICATION OF DRY-AIR BLAST TO THE MANUFACTURE OF IRON.[1]

BY EDWARD DE MILLE CAMPBELL.

In the discussion of Mr. Gayley's paper on "The Application of Dry-Air Blast to Manufacture of Iron," most of the authors have attempted to explain the remarkable results solely on theoretical grounds.

As Mr. E. Windsor Richards has explained, Mr. Dawson showed more than one hundred years ago that blast furnaces are influenced by variations in the amount of moisture in the air, more fuel, as a rule, being required in summer than in winter. This fact has been a matter of general knowledge to blast furnace men since Dawson's time, but they do not seem to have appreciated the extreme sensitiveness of a blast furnace to variations in atmospheric moisture, until Mr. Gayley demonstrated the remarkable improvement which can be brought about by reducing the amount of water carried in by the blast to a small and practically constant amount.

The great economy in operation is not due to the saving of energy required for dissociation of water in the blast, which it has shown by others does not exceed 3 or 4 per cent of the total energy evolved by the fuel, but is due to uniformity of conditions in the hearth, which permits a uniform temperature to be maintained in that part of the furnace. That the great value of dry air is principally due to the elimination of the daily hygrometric variations may be clearly seen from a study of the observations made by me 16 or 17 years ago, while I was chemist for the Dayton Coal & Iron Co., of Dayton, Tenn.

Before going south, I had held a similar position with the Sharon Iron Co., at Sharon, Pa. One of the first things I noticed on going to the Dayton furnace, which was so much further south than the one at Sharon, was that the southern furnace at that time apparently had much more difficulty in running uniformly, especially in the winter months, than did the furnaces which were located further north. After watching the furnaces carefully for some time, I noticed that the furnaces usually took more charges during the night-shift than during the day. I also noticed that on several occasions, when there was a marked change in the weather, the furnace seemed to be influenced by the change. The only cause I could see for the furnace driving faster at night than during the day time was that at night there was apt to be a heavy precipitation of dew, with consequent diminution in the amount of moisture blown into the furnace. The effect of this was usually manifest about 9 or 10 p. m., when there was a marked increase in the rate of driving, which was normally maintained until about the same hour in the morning; that is, the furnace ordinarily responded to the change in the amount of moisture within about 4 or 5 hours after the change had taken place. After observing the furnace for some months, I became so impressed with the sensitiveness of the blast furnace to atmospheric changes, that I decided to make a systematic set of observations to determine to what extent these changes affected the operation of the furnace.

To this end an ordinary hygrometer, consisting of a wet and dry-bulb thermometer was placed in the stock-house, where there was a free circulation of air, but protected from direct drafts, and the dew-point was determined. The amount of moisture per cubic foot of air was found from physical tables, and the figures so found were used as a basis for calculating the amount of coke required to dissociate the water carried in by the blast. Four readings per day were made at 5 a. m., 12 m., 5 p. m. and midnight. At the time the readings were taken to determine the dew-point, the number of revolutions of the blowing engines was also recorded.

From the furnace books, the number of tons of each grade of iron produced daily was taken, as well as the number of pounds of ore charged into the furnace for each unit weight of fuel.

In order to determine the amount of coke required per day, for the decomposition of the moisture introduced by the blast, the following assumptions were made: (1) that the blast was actually on 23 out of 24 hours, a loss of 1 hour being allowed for the time during which the blast was off for flushing the cinder or casting the iron; (2) on account of the inefficiency of the blowing engines and leaks in the hot-blast stoves, mains, etc., that 60 per cent only of the piston dis-

[1] A discussion of a paper by James Gayley, read at the Lake Superior meeting of the American Institute of Mining Engineers, September, 1904. Discussion read at the Bethlehem, Pa., meeting, Feb. 21, 1906.

placement actually entered the furnace; (3) that nine-tenths of the carbon of the coke reached the neighborhood of the tuyeres, where the heat developed by its combustion to carbon monoxide was available for dissociating the water vapor.

The coke we were required to use contained an average of 21 per cent of ash and about 75 per cent of carbon. I selected the figures 23 hour—60 per cent piston displacement, and 90 per cent of the carbon of the coke reaching the tuyeres—as conservative figures. If the blast was on more than 2 hours; or more than 60 per cent of the piston displacement entered the furnace; or less than 90 per cent of the carbon of the coke reached the tuyeres;—the figure showing the amount of coke required for the decomposition of the moisture would be correspondingly increased.

The term "grade-heat" was one invented in order to enable the temperature of the furnace, so far as it was indicated by the kind of iron being made, to be expressed in figures and recorded graphically. At the time these notes were made, we had no reliable figures showing the temperature existing in the lower part of the blast furnace. Also, at this same time, the iron was graded by fracture as follows, the grades being arranged according to the temperature of the furnace at the time the iron was produced,—white, mottled, gray forge, No. 3 foundry, No. 2 foundry, No. 1 foundry, No. 1 soft, No. 2 soft, and silver gray or glazed iron. Since the furnace was usually worked on foundry iron, a grade heat of 1.00 was empirically adopted as representing the temperature existing in the furnace at the time No. 1 foundry iron was being produced. If the furnace cooled off sufficiently to produce No. 2 foundry iron, the grade heat, 0.98, was adopted; similarly, 0.96 represented No. 3 foundry iron, 0.93 gray forge, 0.90 mottled and 0.88 was the grade heat employed when the furnace was cold enough to produce white iron. On the other hand, when the furnace was hotter than was necessary to produce No. 1 foundry iron a grade heat of 1.02 was employed to indicate No. 1 soft iron, and 1.03 to indicate No. 2 soft; and if the furnace became hot enough to produce silver gray or glazed iron, this was indicated by a grade heat of 1.05. While these grade heats probably do not express the exact ratios of the temperature existing in a blast furnace at the time the different grades of iron are being produced, they do represent the relative temperature, and afford a means of expressing, in figures, the conditions of a blast furnace. In order to determine the grade heat for the blast furnace for any given day, resort was made to the daily report of the iron grades. From this report the number of tons of each grade of iron was obtained, and these amounts were each multiplied by the proper grade heat, and the sum of these products was divided by the total number of tons produced. For example, if the furnace made 105 tons in a day, consisting of 40 tons of No. 2 foundry, 30 tons of No. 3 foundry, and 35 tons of gray forge, the mean grade heat would be found as follows:

40 x 0.98	39.2
30 x 0.96	28.8
35 x 0.93	32.55
	100.55

100.55 ÷ 105 = 0.957, the mean grade heat of the day.

Daily observations were made on the two blast furnaces of the company from July, 1888, to August, 1890, inclusive, at which latter time I resigned my position. The result of all these observations were plotted in curves which showed the dew-point, yield of iron per day, the grade heat and the burden of ore per buggy.

From the original curves, extending over a period of 26 months, I have selected typical instances showing the influence of variations in the dew-point on the working of the furnace. The results of some of these variations are given in Table I., and the data of these sections of this table are shown graphically in Figs. I, III, VII, XI.

A study of these curves revealed some exceedingly interesting relations,—especially the sensitiveness of a well burdened furnace to atmospheric changes. In studying these curves, it must be borne in mind that the variations in atmospheric moisture are not the only irregularities in the material entering the furnace, because the solid material—coke, iron ore and limestone—are liable to vary from day to day. The company operated furnaces No. 1 and No. 2, which were apparantly alike in size (75 feet high, 18 feet bosh, 9 feet hearth), each having eight 6-inch tuyeres. No. 1 furnace was considerably further from the engine house than was No. 2, which seemed to be about the only differences in the furnaces, yet No. 1 would never average as large a yield of iron, nor would it carry as heavy an ore burden, as would No. 2. A study of the curves show that while No. 1 furnace was in general affected by atmospheric changes, like No. 2, the extent of the changes was not usually as strongly marked as in the latter furnace. If a furnace is carrying a full burden of ore, the heat being well concentrated in the hearth, with a cool top and the dew point rises—that is, the amount of moisture introduced at the tuyeres is increased—the effect of this begins to show within 5 or 6 hours, either through a falling off in the grade heat alone, or in a cooling off of the furnace occupied by slower driving. On the other hand, if a furnace is running normally, with the heat well down in the hearth, with the top cool, and there is a fall in the dew point, the effect is first shown by a rise in the grade heat and an increase in the rate of driving,—that is, an increase in the output of iron. If the dew point remains persistently low, and the ore burden is not increased, the effect is frequently to raise the width of the fusion zone, after two, three or sometimes four days, the grade heat often falling off somewhat as the height of the fusion zone is increased. If, after several days' running with an abnormally high fusion zone, the dew point again rises, the effect is frequently to lower the fusion zone suddenly, coincident with the falling off of the grade heat. This sudden lowering of the fusion zone causes the stock to come in contact with that portion of the bosh walls which was superheated during the period of low dew-point, and tends to stick and form scaffolds. These incipient scaffolds afterward give way under the weight of the stock, causing slips and slides.

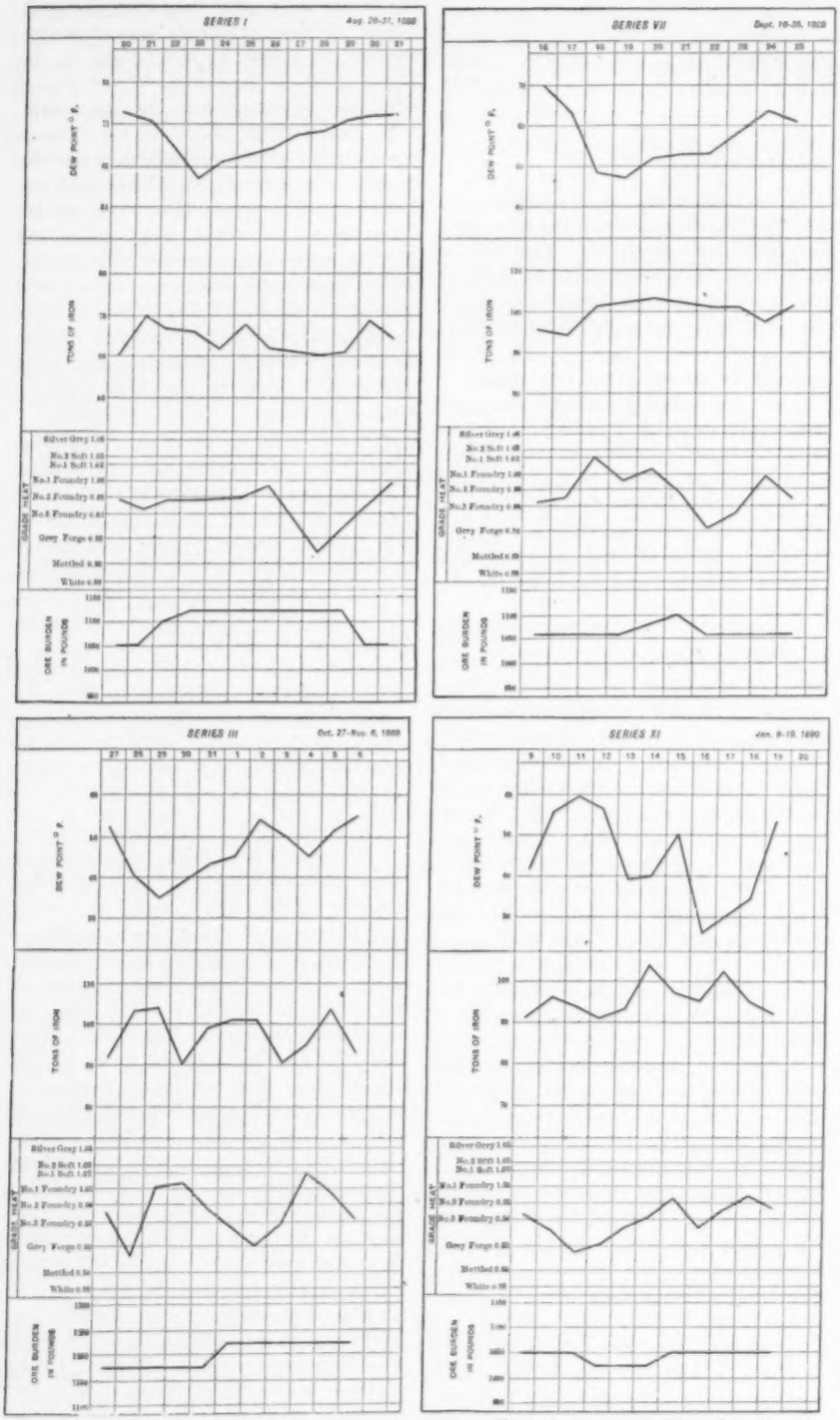
If a furnace is normally "underburdened," if such an expression may be used, a change in atmospheric moisture does not usually produce as marked an effect on the furnace, since the total heat energy developed in the furnace is greater than should be required, and the effect of an absorption of heat by increased amount of moisture in the blast would not be as noticeable as if the furnace were carrying a full burden. On the other hand, No. 1, furnace, which was usually underburdened, had a greater tendency to form incipient scaffolds than did No. 2, which usually carried a full burden.

Up to the time these systematic observations were made, much trouble has always been experienced from scaffolds, especially during the months of January and February. During these months in the south the fluctuations in the moisture are apt to be very great, and consequently the conditions conducive to the formation of scaffolds occur most frequently. Moreover, the dew point is apt to be low for several days, thus tending to increase the height of the fusion zone, and then rise quite rapidly, causing a sudden contraction in the fusion zone, with the tendency toward the formation of scaffolds. When the most frequent cause of these irregularities was appreciated, proper steps were taken whenever a marked change in the dew point indicated the necessity. By careful controlling of the burden, etc., according to the indications, as shown by the hygrometer, many of these irregularities, which had previously been such a serious cause of trouble, could be overcome. Thus, in many instances, when the foundryman perceived that the dew-point was rapidly rising, he would put in an extra charge of fuel without any ore. This extra fuel would prevent the grade

heat from falling, but, as it was not registered in the furnace book, it is not shown in the curves.

In the summer months, although the dew point was very high, the fluctuations were usually confined to rather narrow limits, so that the furnace would not carry as heavy an ore burden as during the colder months; but the work of the furnace was apt to be more regular than during the winter months.

While it is extremely difficult to express in numbers the exact saving that would be effected in blast furnace practice by removal of the moisture from the air, my two years of close observation of the influence of atmospheric changes on the furnace operation convinced me that at least two-thirds if not three-fourths of the irregularities in blast furnace running were directly attributable to the varying amount of moisture entering the furnace. The lack of uniformity in the grade of the iron, and the irregularity in the running of the furnace, is due not so much to the amount of moisture entering into the furnace at a given time as the fluctuations in the amount of moisture on different days.



I cannot but feel that, if Mr. Gayley has succeeded as he apparently has, in reducing the amount of moisture to a small and constant amount, his invention will eventually prove to be the most important advance in the metallurgy of pig iron since the introduction by Neilson of the hot blast, more than 75 years ago.

TABLE I.—DATA OF BLAST FURNACE OPERATIONS AT DAYTON, TENN.

Date.	Dew-Point.	Coke for Decomposition of Moisture.	Daily Output of Iron	Grade-Heat.	Ore Burden.
1888.	°F	Lbs.	Tons		Lbs.
Aug. 20	74	32.48	68	0.977	1,050
Aug. 21	72	29.72	78	0.969	1,050
Aug. 22	66	24.92	75	0.975	1,100
Aug. 23	58	18.11	74	0.975	1,125
Aug. 24	62	22.03	70	0.979	1,125
Aug. 25	65	24.92	76	0.980	1,125
Aug. 26	66	24.50	70	0.993	1,125
Aug. 27	69	26.07	69	0.957	1,125
Aug. 28	70	23.44	68	0.915	1,125
Aug. 29	72	27.67	69	0.945	1,125
Aug. 30	73	30.69	77	0.973	1,050
Aug. 31	73	30.69	71	0.997	1,050
1888.					
Oct. 27	60	19.56	92	0.970	1,175
Oct. 28	48	12.49	103	0.918	1,175
Oct. 29	43	10.66	104	1.000	1,175
Oct. 30	47	12.62	90	1.005	1,175
Oct. 31	51	13.99	99	0.975	1,175
Nov. 1	53	14.74	101	0.953	1,225
Nov. 2	62	19.99	101	0.930	1,225
Nov. 3	58	17.14	90	0.958	1,225
Nov. 4	53	15.29	95	1.820	1,225
Nov. 5	59	19.41	104	0.997	1,225
Nov. 6	63	21.25	93	0.962	1,225
1889					
Sept. 16	70	27.39	95.5	0.964	1,060
Sept. 17	63	21.82	94.5	0.970	1,060
Sept. 18	48	13.64	101	1.020	1,060
Sept. 19	47	12.40	102	0.992	1,080
Sept. 20	52	15.42	103	1.005	1,100
Sept. 21	53	15.70	102	0.978	1,060
Sept. 22	53	15.01	101	0.932	1,060
Sept. 23	59	19.42	101	0.951	1,060
Sept. 24	64	23.53	98	0.999	1,060
Sept. 25	61	20.42	101	0.967	1,060
1890					
Jan. 9	41	9.89	91	0.967	1,050
Jan. 10	55	16.22	96	0.949	1,050
Jan. 11	59	17.07	94	0.923	1,050
Jan. 12	56	16.33	91	0.930	1,025
Jan. 13	39	8.81	83	0.952	1,025
Jan. 14	40	9.78	104	0.962	1,025
Jan. 15	50	13.53	97	0.985	1,050
Jan. 16	26	5.64	95	0.952	1,050
Jan. 17	30	6.80	102	0.971	1,050
Jan. 18	34	7.88	95	0.988	1,050
Jan. 19	53	15.56	92	0.973	1,050

A New Nickel-Iron Alloy.—Souesite is the name given to a native nickel-iron alloy recently found in British Columbia. It is very similar in composition to the awarnite of New Zealand, the josephinite of Oregon, and to an iron-nickel alloy of Piedmont. It is a gray metallic sand, forming the heavy residue from the gold washings on the Fraser River, near Lillovet, in Brtish Columbia. Of the whole sand 47 per cent consists of an iron-nickel alloy, which is in the form of small, very irregularly shaped rounded grains of a faint yellowish steel gray color, with sub-metallic lustre; it is strongly magnetic and is malleable. Its specific gravity is 8.215, and the percentage composition of it has been found to be:—Nickel, 75.50 per cent; cobalt, nil; iron, 22.02 per cent; copper, 1.20 per cent; and siliceous matter, 1.16 per cent.—*The Iron & Coal Trades Review*

BIG RAIL TONNAGE.

Negotiated For by Toronto Street Railway.—Canada Makes Its First Steel Cars.

(Special Correspondence.)

Toronto, Can., Feb. 19.—The Toronto Street Railway is negotiating with the United States Steel Corporation Works at Lorain, Ohio, for from 5,000 to 6,000 tons of steel girder rails to relay the leading routes. They are to weigh about 90 pounds, being about 20 pounds heavier than those now in use. In addition it will require about 1,000 tons of T-rails for the extensions over new routes, which have been ordered. The total expenditure for rails and joints will be about $350,000. A large supply of rails will also be needed for the York Radial roads extending out into the rural districts.

The first steel cars ever built in Canada, consisting of 500 steel drop-bottom gondolas of an aggregate value of $750,000, have been ordered by the Canadian Pacific Railway from the Dominion Steel Car Co. Heretofore the steel cars in use on Canadian railways have been built in the United States. They will be placed in service on the Crows Nest section of the C. P. R. system.

The Intercolonial Railway will increase its equipment by the addition of rolling stock representing an expenditure of $584,000 including 16 high-class passenger locomotives of the Pacfic type ordered from the Locomotive and Machine Co., Montreal.

A statement respecting the proposed merger of the Dominion Iron & Steel Co., Dominion Coal Co., Nova Scotia Steel Co. and the Consolidated Lake Superior Corporation is positively denied by F. H. Clergue, who was in Toronto a few days ago, as well as by other offiicals.

The Warden King Co. of Montreal, manufacturer of heaters and boilers, has purchased a site on Lombard street, Toronto, for the purpose of establishing a warehouse. It will erect new buildings to cost about $40,000.

The Illinois Steel Co., Chicago has placed contracts with the Southwark Foundry & Machine Co., Phidelphia, for three blowing engines, 44 x 84 x 84 x 60, and with the Rust Boiler Co., Pittsburg, for twelve, 350 horsepower boilers, all of which are to be installed in the power plant of the new blast furnace which is building at Joilet, Ill. The company also ordered last week from the Allis-Chalmers Co., two 200 kilowatt gas engines for driving generators, for installation in the power plant at the South Chicago works.

BOOK REVIEWS.

"Crystallization of Iron and Steel." By J. W. Mellor. New York. Longmans, Green & Co., 144 pages. 65 illustrations. 5¼ x 7¼ inches. Cloth. Supplied by THE IRON TRADE REVIEW at $1.60

This book consists of a course of six lectures which were delivered to the engineering students of the Staffordshire County Technical Schools class, at New Castle, England, during November and December, 1904. It summarizes the results of the more important researches which have been made during the last ten years on the constitution of iron and steel. The lectures deal in the solidification and cooling of alloys, the constitution of iron and steel, the hardening, annealing and tempering of steel, the crystallization of iron and steel, the influence of stress and strain and the method of preparing specimens for the miscroscope.

There is an appendix of twenty-five pages which contains a glossary of the terms peculiar to the subject, which occur in the book, together with their derivation. Various features of the subject of metallography are simply and thoroughly explained and the significance of the appearance of the metals after fracture is well brought out. The book is abundantly illustrated with engravings of various metals which have been etched in different manners and, also with line drawings setting forth chemical and physical phenomena. It is a valuable reference book, and in addition is rather interesting reading to those who care for such a subject.

The Architect's Directory and Specification Index, For 1905 and 1906. Published by W. T. Comstock, New York, 176 pages, 7 x 10 inches. Cloth. Supplied by THE IRON TRADE REVIEW for $2.00.

This book contains a complete list of the architects of the United States and Canada, classified by states and towns, and indicates those who are members of the American Institute of Architects and also the names of the different officers, and locations of the different architectural associations in the United States. In addition there is a brief specification index of prominent dealers and manufacturers of building materials and appliances. There is also a list of the landscape and naval architects of the United States and Canada, indicating those who are members of the American Society of Landscape Architects & Engineers. To these is added a list of the building departments of the principal cities of the country, together with the names of the officers. This is the seventh annual edition of this work, and is carefully prepared. The specification index will be found convenient to architects, builders and owners as a compilation of the various lines of trades supplying building material and appliances. The entire work will be found of special value to architects, manufacturers and dealers, desiring to reach the architects of the country.

"Machine Shop Arithmetic," published by The Derry-Collard Company, New York City; 4 x 6 inches; 144 pages; flexible cloth covers. Supplied by THE IRON TRADE REVIEW for 50 cents.

This is the fourth edition of this useful little pocket book, which was gotten up by Fred E. Colvin and Walter E. Cheney.

In addition to the valuable matter contained in the previous editions, new material has been added upon metric threads, force, shrink and running fits, and the book has been improved in other ways.

One great advantage, which this book possesses over similar works, is that, in place of giving arbitrary rules, the writers have aimed to make the subject so clear, and to explain the details so thoroughly, that the workman will be able to solve the problems himself. In other words, the book tells why, and, in many cases, serves to cultivate the ability to analyze a problem. The problems solved in the book serve as guides to similar ones coming up in practice.

Colorado Fuel Additions.—Important improvements at the plants of the Colorado Fuel & Iron Co. are forecasted in an interview given recently by President Frank J. Hearne at Denver as follows: "We have under consideration an extension to our ingot heating capacity at the rail mill with the necessary addition of buildings and traveling cranes to cover the operations of the same; we also have under consideration an addition to our basic open-hearth steel making capacity with the necessary accessories thereto. All of the above is in a formative state and not yet sufficiently developed or determined to make public what our actual probable intentions may be. We hope within the next week or two to be able to state definitely our conclusions regarding them."

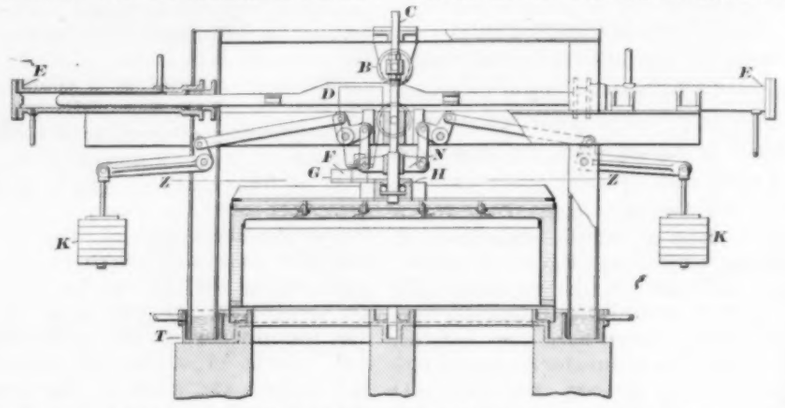
The Monarch Manufacturing Co., which was recently incorporated with a capital stock of $500,000, to manufacture fire appliances of all kinds, has leased the plant formerly occupied by the American Sparklets Co., at Bridgeport, Conn. Equipment is being installed and operations are expected to begin within a short time.

THE DYBLIE REVERSING VALVE FOR GAS FIRED FURNACES.

A new reversing valve adapted for use in connection with open-hearth, soaking pits and similar furnace installations, and which differs radically from most of those in use at present has been developed by Mr. J. A. Dyblie, chief engineer of the Joilet works of the Illinois Steel Co. It is now being placed on the market by the Morgan Construction Co., Worcester, Mass., which has acquired the selling rights.

The first valve was placed in service at the works of the Illinois Steel Co. about five years ago. It has been in constant use and has given satisfactory service during that period, and has required only slight repairs. A large number of these valves have been in service at the same works for more than two years with no repairs whatever, and the company is about to install 48 additional valves as a result of their experience. This valve has also been adopted for the new open-hearth plant of Milliken Bros., Staten Island, N. Y.

The construction and operation of the valves are illustrated in the accompanying drawings. Fig. 1 shows a plan end elevation in one of the operating positions. Fig. 2 shows valve raised and turned 90 degrees, and ready to drop into the water seal to reverse the path of the gases, as shown in Fig. 1. The openings 1 and 3 are connected to the furnace, the opening 4 to the stack, and 2 to either the gas or air supply. There is no overhead flue connection to a valve of this character. Over the openings to the flues 1, 2, 3, and 4, is placed an inverted cylindrical box, provided with a single partition running across on the diameter. This partition is shown at A in the elevation Fig. 1. The edges of the box and of this partition dip into the water seal casting T, thus preventing any escape of the gases to the outside air. With the valve in the position shown in Fig. 1 there is a free opening between ports 1 and 2, and between 3 and 4. Thus the passage of the gas or air will be from 1 to 2, and thus into the furnaces. It returns through 3 into 4 and thence to the stack. If the valve, however, is turned through an arc of 90 degrees so that the partition A rests along the line YY in the plan, Fig. 1, the passage of the gas or air would be from 2 to 3 and from 1 to 4 and thence to the stack.



Section taken on line y-y, below line Z-Z but with valve turned 90°

FIG. 2—DYBLIE VALVE REVERSED.

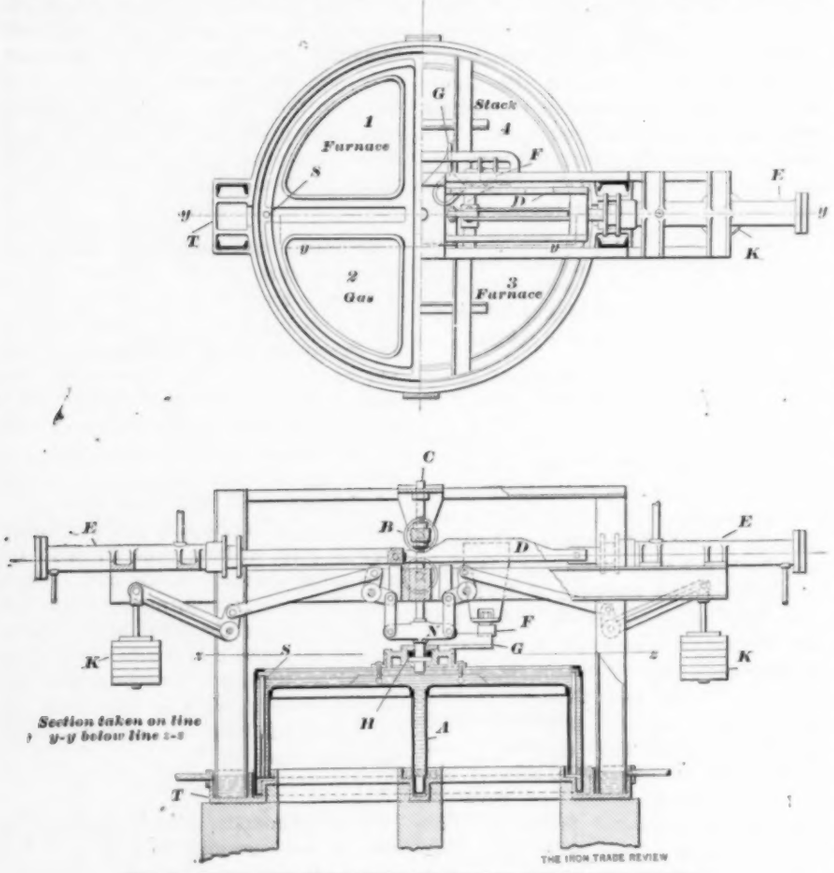


FIG. 1—PLAN AND ELEVATION OF DYBLIE REVERSING VALVE.

To reverse the valve it is necessary to raise the valve body a sufficient distance to allow the center partition to clear the edges of the water seal before the valve is turned. The edges of this center partition are accordingly made shorter than the lips at the circumference, as shown in Fig. 2. This permits the valve to be turned without breaking the water seal. The mechanism by which this is accomplished is as follows: The weight of the valve is borne by the wheels B, attached to the spindle C, which is arranged to permit a free vertical movement. The wheels ride on cam bars D, which are operated by the two cylinders EE on either side of the valve. If the cam bar be pushed one way or the other the wheels B will ride up on the cam, and the entire valve be lifted.

The turning of the valve is accomplished by the roller F, which is rigidly connected to the cam bar D. The roller engages the channeled arm G, which is attached to the valve. As D is moved the roller F engages the arm G and turns it, and consequently the valve, through the necessary arc. As the cam bar reaches the limit of its travel, the wheels descend on the opposite incline, and the valve settles in its new position. The process is repeated in the opposite direction on reversing the valve. The use of two operating cylinders makes it possible to provide an operating mechanism without any inside packed joints. The valve is counterweighted by the weights KK. The ball-bearing collar H at the center of the valve renders the turning of the same comparatively easy.

The valve itself is surrounded by a second cylindrical box, open at the top, which is filled with water and forms a water jacket.

Water is allowed to flow into this jacket up to the top of the overflow pipe S, through which it passes into the water seal beneath, and thus to the overflow and to the waste. Cleaning pockets are provided at the edge of the water seal to facilitate the removal of mud or other impurities from the cross channels of the water seal without disturbing the valve. This cleaning can be accomplished in a very few minutes.

It will be observed that in this design, a valve of the water seal type is obtained with all surfaces which are in contact with the gas water cooled, yet without a closed water jacket of any kind, or one which cannot be reached for cleaning while the furnace is in operation and without interrupting the flow of gas. No high pressure water is needed for cooling and in case of an interruption of the water supply it will be possible to keep the valves filled with hand buckets. The valves are built in sizes equivalent to 16 inches to 48 inches under the ordinary rating.

NEW ENGLAND FOUNDRYMEN'S ASSOCIATION.

The regular monthly meeting of the New England Foundrymen's Association was held at the Exchange Club, Boston, Wednesday, Feb. 14.

Announcement was made that the March meeting would be held in Hartford, Conn., the arrangement being in the hands of the following committee: Henry Souther, of Hartford, Chairman, E. E. Durant, New Haven, Chas. J. Caley, New Britain, and Fred Strong, Bridgeport.

Appropriate resolutions upon the death of Michael J. Dyer, of Valley Falls, R. I., were adopted. President Snow reported the death of Mr. Frederick T. Towne, of Yale & Towne Mfg. Co. The chair appointed Messrs. Carpenter, Caley and Farnsworth a committee on resolutions.

The president then introduced Mr. J. S. Robeson, president of Robeson Process Co., Camden, N. J., who spoke on "Core Sands." Several samples of core sand were exhibited, also photomicrographs showing the great variations in the size and proportions of the different sizes in the sands commonly used for core work.

The meeting adjourned to dinner at six o'clock, after which the president introduced as the speaker of the evening, Mr. Chas. Kirchhoff, editor of the *Iron Age*, who spoke on General Tendencies, Economic and Technical, which are Influencing the Development of the Manufacture of Pig Iron."

The specific gravity of cast iron varies from 6.85 to 7.48. That of wrought iron from 7.4 to 7.9.

SHIP CANAL FAVORED.

In an enthusiastic report the committee on railways and canals of the national house of representatives has approved the Dalzell bill for the incorporation of the Lake Erie & Ohio River Ship Canal Co. The canal, it is provided, shall extend from Ashtabula to a point near Pittsburg, a distance of about 100 miles, and shall have 34 locks, each not less than 340 feet long, 45 feet wide and 12 feet deep. After a term of fifty years the national government is to have the right to acquire the waterway. The probable cost is placed at between $35,000,000 and $40,000,000.

"With this canal in operation," says the report of the committe, "the products of 24 states can be interchanged at a cost of transportation of less than one-sixth what it now costs to move the same products by rail. The population within a radius of 60 miles of Pittsburg is about 2,000,000.

"Pittsburg is the center of the coal and coke producing sections of Pennsylvania, Ohio and West Virginia. These commodities find a large and growing market in the States bordering on the great lakes.

"Pittsburg is the center of the greatest iron and steel district of the world. The ore from the iron mines of the northwest must be brought to the furnaces at Pittsburg. The food products of the northwest find a ready market among the millions of people living at or near the headwaters of the Ohio river and its tributaries.

"The construction of this canal means cheaper fuel for all the great northwest, cheaper ore for the furnaces in the east and cheaper food for all the sections, and therefore it means cheaper cost of living and cheaper cost of manufacturing in all the districts connected by this waterway.

"During the season of 1905 there were received at Lake Erie ports from the iron mines of the northwest over 21,000,000 tons of ore. About 17,000,000 tons of this were shipped by rail to the furnaces at and near Pittsburg.

During the same season there were received at Lake Erie ports for consumption and reshipment about 15,000,000 tons of coal and over 7,000,000 tons of coke. In addition to these commodities there is a very large amount of manufactured products, including limestone, lumber and building material and general merchandise, passed between Lake Erie and the Ohio river annually.

"It is safe to say that during the season of 1905 there were distributed by rail between Pittsburg and Lake Erie ports about 50,000,000 tons of freight."

The report then takes up the question of transportation cost by rail and water, and says the average cost for the past ten years of transporting ore from Duluth to Ashtabula has been about 82 cents per ton, or eight-tenths of 1 mill per ton per mile; coal, 35 cents per ton, or about three-tenths of a mill per ton per mile. The average cost of transporting ore and coal by rail from Pittsburg to Lake Erie is from 6 to 7 mills per ton per mile. In addition there is a transfer and dockage charge of about 15 cents per ton. Allusion is made to the freight congestion on the railroads in recent years, which has interfered so seriously with the great industries of the Pittsburg district. The report continues:

"Taking into consideration the enormous tonnage of the districts directly connected by this canal, and the fact that more than three-fourths of the products of those districts are such as will be afforded cheap transportation by waterway, if such is provided, it is safe to assume that with this canal, opened for traffic it might be reasonably expected to do a business amounting to at least 25,000,000 tons annually.

"Freight could undoubtedly be carried by water from the Ohio river to Lake Erie for 20 cents per ton. Add to this 20 cents for canal tolls and you have the total cost—40 cents—or a saving directly to the freight itself of 50 cents for every ton transported over the present rail rate."

The report estimates that on a business of 25,000,000 tons annually the saving on freight would be $16,250,000. On this business the canal, charging a toll of 20 cents a ton, would have an annual income of $5,000,000. Taking $1,000,000 as cost of operation, the canal company would be left a profit of $4,000,000, equal to 10 per cent on a cost of $40,000,000, or 8 per cent on a cost of $50,000,000.

The Anderson Forge & Machine Co., Detroit, recently purchased from W. H. Anderson & Sons, their buildings located at 21-31 St. Aubin avenue, Detroit. The purchase includes the equipment of the plant, a large portion of the merchandise on hand and the entire manufacturing line of the old business. In addition to the present equipment for the manufacture of crank shafts, steam hammer forgings, concrete mixers and tools, the company will immediately install a full equipment of drop hammers, presses, etc., for the manufacture of drop forgings on an extensive scale. At present the company is not in the market for equipment.

THE MAN OF THE HOUR IN MINING CIRCLES.

CAREER OF THOMAS F. COLE HAS BEEN ONE OF STEADY ADVANCE.

Fondness For Work, Tireless Energy and Remarkable Foresight Have Made Him "Mining King."

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The man of the hour in American mining circles is Thomas F. Cole, of Duluth. To the average man, whose knowledge of mining affairs is but slight and gained at second-hand, the present prominence given Mr. Cole by the press and by men of large affairs must come as something of a surprise, but to those who have known the man and watched his steady rise for the two decades past there is no astonishment. It merely happens that the world at large is becoming acquainted suddenly with a big man who has done big things and is capable of doing even bigger.

As facts are always better than adjectives, and the facts will enable the reader to judge for himself, a brief summary of the salient features in the life and progress of Thomas F. Cole will throw a strong light upon the character of the man. Born forty-four years ago, in Keweenaw county, Michigan, of English parents, at a time when copper mining was more active in that district than is now the case, young Cole was left fatherless at the tender age of six years by an accident in the Phoenix mine, which cost his father's life. Though but a small child in years, there already existed in his breast the courage and persistence so often shown in later years. He was the eldest of an orphan family of small children, and as such it became necessary for him to take up life's battle in deadly earnest, at an age when children of the present generation are just leaving the kindergarten. He did not shrink, and at eight years of age was working on the rock-piles and about the mills of the Phoenix and Cliff mines, hard labor for a small boy, but necessary to be done, to help keep the wolf from the door of the little cottage where his mother and the younger children kept a home—a real home, despite the harsh fate that had deprived the household of its head and natural protector.

Educated by Experience.

From wash-boy in the Cliff mill, at eight years of age, young Cole advanced gradually to positions of greater responsibility and better pay.

Forced to leave school at an age when he had but mastered the alphabet, the boy never faltered in the determination to gain an education, and never neglected an opportunity to learn from books as well as from contact with the world into which he was thrown so young. Odd hours were improved with zeal, and with a persistence that never flagged. As a consequence, young Cole entered manhood with what was fully the equivalent of a common school education, and, what was of far greater importance, in securing this education, by his own efforts without the aid of teachers, he had laid the foundation of studious habits, and learned early in life that all obstacles can be surmounted by those who strive, with undivided efforts, for any goal that is within reason.

While securing an education, in the sense that the word is commonly used, by his own unaided efforts at odd hours after days of exhausting labor, young Cole was gaining a wider and deeper education by actual contact with the world. Nothing so conduces to early maturity of mind as placing a man's burden upon a boy's shoulders, provided the shoulders do not break beneath the load. While still in his teens the lad attracted the favorable attention of his superiors by two qualities which have been retained undiminished to the present day. The two things that marked him out as separate from the common run of boys about the mine and mill were his unflagging zeal as a worker at whatever tasks were set him, and his determination to learn all that there was to be learned about his work and everything connected with it. At fifteen the boy left the mill, attracted by higher wages always needed in a household where there were so many small mouths to fill, and became a brakeman on the Hecla & Torch Lake railroad—a big contract for a mere boy, but one that he filled satisfactorily. On the railroad, which was owned by the Calumet & Hecla Mining Co., the boy's zeal as a worker and his insatiable thirst for knowledge attracted the attention of those above him, just as had been the case before, at the Phoenix and Cliff mines, and it was decided that he was fitted for better things. Given a place as office boy, within two years he was a valued clerk, forging to the front because he never tired of work and courted rather than shunned the hardest tasks to be found. The Chapin, then as now, was the largest iron mine of the Menominee range, and when a good man was needed for chief clerk and cashier, at a property employing upwards of a thousand men, young Cole was selected for the place on the strength of his work at the Calumet & Hecla, despite the fact that he was not yet legally of age.

A "Boy Superintendent."

At the Chapin his experience was much the same as before. Each position secured was better than the one before, but each was made the stepping-stone for something higher. As an office boy at the Calumet & Hecla, none of his duties were neglected, but he also was preparing himself as an expert accountant. At the Chapin, as chief accountant, his work was always perfectly done, but, with the inborn strength of a strong man, he reached out for other world's to conquer, and somewhat to the suprise of those about him who were not quick of wit, it was but a few months before every detail of the business was at his fingers' ends. Ferdinand Schlesinger, of Milwaukee, known fifteen years ago as the iron king, had gathered under his control several small iron mines on the Menominee range. He wanted a man to manage them, and, despite the protests of his friends that "Tom" Cole was merely a boy, made him superintendent. How well this confidence was justified was shown by the surprising manner in which the Schlesinger iron ore interests grew. The most was made of the old mines, new mines were added, small mines became big mines, and within a few years Ferdinand Schlesinger, with Thomas F. Cole as his manager, despite his less than thirty years, became the largest miner of iron ore in the United States, and the older mining men ceased to speak of Cole as a boy.

In 1893 the panic was felt with blighting severity on the Lake Superior iron ore ranges. Cole was then at Negaunee, in general charge of the Schlesinger interests on the various ranges. His end of the work had been well done, but Schlesinger, though a shrewd man and of prophetic vision, took a chance at the wrong time. He had expanded beyond his capital, and when the panic came was in no condition to withstand the storm. It was then that the whole burden developed upon Cole. Money for men and ma-

terial was lacking, railway freight bills were unpaid, suspicion was rife, and when the railroad companies attached the stock-piles of the Queen mines, at Negaunee, for unpaid freight bills of large amount, it was believed that the end had come. It was then that Cole showed two other attributes—courage and loyalty of the highest order. His efforts to save the situation were incessant. Twenty hours' daily work were his usual program for some weeks. Every effort was made by him to keep the ship afloat. Personal appeals to the men at the mines were met with a ready response, for the men who worked with him and under him knew the man, and believed in him. No general, fighting a rear-guard action to permit the drawing off of a defeated army ever displayed more courage or tactical ability than did Cole in fighting a brave but hopeless battle for his employer. For six weeks he kept the Queen mines going, though bankrupt. His own small savings were thrown into the fight, without hesitation. Urgent demands for cash were met with his personal checks, until his own funds were exhausted—and then the inevitable happened—the mines closed down, and Cole began work instantly to see that the workmen who had trusted him and followed him were paid in full, and promptly, which was done.

The modern employe who combines great ability with the loyalty that stops at no personal sacrifice, is not so common that he is likely to be overlooked, and since the panic of 1893 Thomas F. Cole has been a marked man, as there are instances where a defeat is more glorious than a victory. Schlesinger went to Mexico, where he succeeded in partially recouping his fortunes within a few years, and Cole was left without a job—but not for long. Such men do not go begging for work, and congenial employment as a mine superintendent was offered him quickly, on the neighboring Gogebic range, where the same qualities that he had displayed before speedily brought recognition. Within a few years he was at the head of the great Norrie and other mines, producing more ore than he had ever secured for Schlesinger.

Heads Oliver Company.

The United States Steel Corporation was organized, and the position of vice president of the Oliver Iron Mining Co., which is the iron ore end of the trust, was offered to Thomas F. Cole, and accepted. Within another year he was made president of the company, the greatest metal mining corporation in the world, which employed nearly twenty thousand men and shipped twenty million gross tons of iron ore during the year 1905—enough iron ore to load a fleet of one-thousand-ton steamers reaching, if connected by the ordinary 600-foot tow-line, from New York to Liverpool, or to load a solid railroad train reaching from New York to San Francisco, with enough ore left over to load another railroad train reaching from Lake Superior to the Gulf of Mexico.

Most men not yet turned forty years of age and arrived at the head of the greatest metal mining corporation of the world would have been satisfied to rest upon their laurels, but not so with Cole. He was endowed with a wonderful physique and a superabundant and never-failing supply of energy; there always stretched before him new things to do. The task set him as president of the Oliver company would have occupied an ordinary man to the exclusion of all other matters. The Oliver company, when Cole took charge, was merely a collection of mines and companies, without coherence, method or solidarity. Suspicion was more common than enthusiasm, and from superintendents down to miners the feeling was one of distrust, rather than of confidence. How thoroughly all this has been changed in five years is known to those conversant with the iron industry. The good men have been kept—and every man has been given a fair chance, and possibly a little more, to prove himself a good man. Of the nearly twenty thousand employes of the Oliver company, every man knows he will be given a square deal all the way through. There are few employes of the corporation unacquainted with the president by face and voice, and a memory like wax to receive and like iron to hold, has helped Mr. Cole to remember not only the faces but also the names of thousands of his employes. System has been installed where chaos reigned. Order has been evolved in every department, and the change has been brought about with such a lack of friction that the company has the loyal and enthusiastic support of its employes. To those who are disposed to criticise all great corporations on general principles as robbers and oppressors, it may be stated that the Oliver company pays higher average wages to more men, and furnishes steadier work than ever was the case in the iron fields before its organization. If it be objected that this is an ex parte statement, and that the men themselves might tell a different story, it may be further stated that the Oliver company has had no strikes. There is no need of any. Any employe with a grievance, whether real or imaginary, will be given a respectful hearing by any superintendent, and, if he wishes, can take it to the president himself, and be sure of receiving justice.

Success in Copper.

In March, 1899, a company of Calumet, Michigan, men, formed a little exploring company to attempt developing a copper mine in Bisbee, Arizona. As a former resident of Calumet, T. F. Cole was of the number. Though offically but a director, he has been the strong man of the combination from the first. From this original development company has sprung a succession of remarkable mining companies, in all of which Cole has been the guiding genius. Of the numerous corporations since formed, not one has proven a failure, and two, the Calumet & Arizona and North Butte, are among the largest copper producers and greatest dividend-payers found among American copper mines. The story of the Calumet & Arizona, the parent of the brood, would make a book by itself—and a romantic as well as a truthful book. As the shaft dropped downward, with no ore in sight, the timid lost hope. Still the shaft continued—kept on dropping, not to be stopped until the last dollar was sunk—and at last, nearly a thousand feet below daylight, a bonanza mine was operated. Immediately other claims near at hand were secured—other development companies organized, and other mines opened. A feature of Mr. Cole's character that strongly impresses those who come in close contact with him, is his unwillingness to "mark time.' Each achievement is but the precurser of something beyond—not that the work in hand is ever neglected, but as soon as it is well in hand there are other and greater things to be done. So with the Bisbee field. The Copper Queen, one of the richest of American mines, was for a quarter century the only mine of Bisbee, but in less than seven years since the first option was taken, Cole and his associates have developed three producing copper mines and have two others partly developed with other valuable lands held for the future.

What was done at Bisbee has been repeated, within the past twelve months, only upon a more rapid and spectacular scale, in Butte, the greatest copper camp of the world. For many years the situation at Butte was simple. The Amalgamated, Senator Clark and Heinze owned or controlled everything making copper, or that was supposed to be capable of making copper at a profit. Suddenly the old and small Speculator mine was bought by Cole

and his associates. Adjoining lands were secured, and before the conservatives had ceased rubbing their eyes, the mine was making two to three million pounds of copper monthly, and paying dividends at the rate of better than a million dollars yearly. Just as Cole woke up the Copper Queen in Bisbee, so he woke up the Amalgamated and other producers of Butte. The known productive territory of the camp was increased by fifty per cent, and it became apparent that a new power had arisen in the copper world.

Total Copper Accomplishments.

Leaving out of further consideration Cole's achievements in the iron ore trade, which have been remarkable in themselves, brief attention may be given to what he has accomplished within a few years in the copper industry. Figures speak louder than words at times, and the figures of value added by Cole and his associates to the wealth of America are astounding. The following table gives the present market values—not capitalization, but prices at which the stocks are freely bought and sold, in transactions running into millions of dollars monthly—of the various development and mining companies of which Cole is the guiding genius:

Company.	Market values.
North Butte	$34,800,000
Calumet & Arizona	23,600,000
Lake Superior & Pittsburg.	11,750,000
Calumet & Pittsburg	7,200,000
Pittsburg & Duluth	7,200,000
Junction	6,625,000
Black Mountain	5,000,000
Keweenaw	2,700,000
Warren	960,000
American Dev. Co.	800,000
Chiricahua	480,000
Manhattan	200,000
Total	$101,415,000

An addition of upwards of one hundred millions of dollars to the tangible wealth of the United States is no small achievement. And the sum is not paper profit. Although only four of the twelve properties have as yet reached the stage of actual production, and but two of the four are producing to anything like their ultimate capacity, the monthly output materially exceeds one million dollars in copper, gold and silver values. A fifth property, the Black Mountain gold mine, is to start production soon, upon a large scale. None of the companies now have any stock for sale, and none have been promoted through printer's ink. All have started business with their capital fully subscribed, and many have had their entire stock issue many times over subscribed. The mere rumor of a new Cole flotation is sufficient to bring subscriptions by telegraph for more than the entire issue. The rumor last October that Mr. Cole was to float a new property in the Globe district of Arizona brought a deluge of attempted subscriptions. I personally saw one subscripton for 25,000 shares, from a man whose name is good—he did not know the price, name, location or any other details, but wanted 25,000 shares, which, as the Cole stocks have been put on the market at $10 and $15 each, was an attempted obligation to the extent of anywhere from $250,000 to $375,000—merely because he thought "Tom" Cole was behind the deal.

Generous, Not Wealthy.

It might be inferred, quite naturally, that the man who has increased the tangible wealth of the nation by a hundred million dollars within a few years would be a multi-millionaire, but such is not the case. Mr. Cole undoubtedly is worth upwards of a million, probably two millions, and possibly as much as three, but not more. He might be worth several times his present fortune, but for a penchant he has for making his friends wealthy. He has hunted up and rewarded all the men who befriended him in the troublous days when he was a poor man and friends were genuine and not attracted by the glamor of wealth. He has helped the men under him to accumulate wealth—has subscribed for stock in their names, endorsed their notes, and advanced them cash to carry the subscriptions. This he has done, not with one or with a dozen, but with scores. It need not be inferred however, that he is a soft mark for oily tongues and grafters. Every man he has helped has been personally known to him, and believed deserving. The professional hunter for "good things" would never believe that any suspicion of the milk of human kindness attached to T. F. Cole, for he can turn as steely an eye on the men he distrusts as any man who is a target for chicanery. He does not love wealth for its own sake, neither does he despise it. Money is a lever, of which he recognizes the advantage, but his real ambition in life is to do things—big things and yet bigger things—and the wealth that follows is an incident, rather than the real aim.

Personally Mr. Cole is a big man physically, with strong limbs, a deep chest, a digestion unimpaired because never abused, and no bad habits except a mania for hard work, which in his case does not seem such a bad habit, because he possesses the capacity of resting himself, after a long and hard day's labor, by tackling some other piece of work. His habits are simple and his manner exceptionally direct. He is far prouder of the fact that his word is always worth par than that he has added a hundred millions to the wealth of the country in copper and gold mines, not to mention a probably greater sum that he has added to the assets of the Steel Corporation through his wonderfully able management of the Lake Superior iron mines.

With his friends and those he trusts Mr. Cole is frank and outspoken. Occasionally he is deceived, but never twice by the same man. Life holds too many things worth while for him to nurse a grudge, but the man who plays double with him is simply dropped from the rolls of his acquaintance for all time. The world is large, and Cole can find occupation and friends without bothering about the men who cannot be trusted.

Believes in Hard Work.

The opportunities that this modern Midas has given others for the coining of money have not been confined to wealthy and influential men. Hundreds of common miners have been given a chance to put dollars where they have quickly grown to tens and twenties. The boy who went to work on the rock-piles of the Phoenix at eight years of age has grown into the man who appreciates and honors labor, and his appreciation is none the less profound because he is not given to mawkish sentimentality about the poor laboring man. He works himself, believes others should work, will have no drones about, but will stick by any man who does honest work to the best of his ability. His men know this and it is one of the secrets of his remarkable popularity with the great army of workmen under his direction.

COST OF ERECTING STRUCTURAL STEEL.

The cost of erecting structural steel is given by Mr. William McArthur in an article in the *Engineering and Mining Journal*. A brief summary of the figures developed in this article is as follows: For buildings of from one to three stories, using a hand derrick—$5 per ton for erecting cast iron and steel, store fronts, vaults, interior columns and beams; for ordinary structural work, the cost averages about $7.13 per ton. This last figure assumes that a hoisting engine is provided and compressed air used for riveting, and that equipment, scaffolding, ropes and tackle are ready for use. Nearly one-fourth of this figure is for riveting.

The American Pig Iron Storage Warrant Co. reports for January as follows: Stocks in warrant yards, Dec. 31, 57,200 tons; received during January, 2,500 tons; delivered during January, 15,000; total on hand January 31, 44,700.

CORE SANDS.[1]

BY J. S. ROBESON.[2]

The company with which I am connected has been engaged in the manufacture of a core sand binder for the past 12 years and, as this product forms about 25 per cent of its output, naturally a great deal of time and money has been spent in studying the question of binders; whether these had best be solid or liquid; made of dextrine, flour, rosin or oil, etc., etc.

Some of the tests made in this investigation, and what I believe to be the results proved by them, have already been published. When this work of investigation was commenced almost the first problem for which an answer was requested was: Why do the different core sand binders or compounds act differently in different foundries? This failure in one shop and success in another is a fact that is true of every material used as a core binder, whether it be a proprietary article or not. It is more marked—or perhaps it is better to say, more noticed—with the proprietary articles than it is in the three most commonly used materials, flour, oil and rosin. What is the reason for this difference?

In looking for the cause of such a trouble it seems to me that you want to go over carefully and in detail each step of your manufacture and find, if possible, the "variable," the thing that changes or is liable to change the most often. When making a core the two things that are thought of first and that are as a rule considered the most important, are the sand and the binder. There are two other points that while not of equal, are of great importance. These are the mixing and drying. The latter is often, if not usually, more or less slighted.

Foundries use for molding and core making purposes, sand and loam. Sand may be defined as water-worn disintegrated rock without plasticity or adhesiveness. Clay, as the remains of disintegrated rock that is both plastic and adhesive. Loam, as a mixture of clay and sand. As none of these three are ever met with in a pure state in nature, the variations in composition are unlimited. It is almost within the bounds of the strict truth to say that every foundry uses its own particular sand or sand mixture for making cores.

A sand either contains clay or it does not; its grains are either angular or they are not. These conditions govern its strength and make the four main kinds. Now while these four govern, the strength is really more directly controlled by the size and the proportions of the various sizes of the grains.

Having the four kinds:

Sand with angular grains
Sand with angular grains and clay
Sand with round grains
Sand with round grains and clay

and then the possible variations because of size of grains it is easy to see why the core making conditions as to the sand in any two foundries are seldom alike and why the sand is a variable, and, if you eliminate the personal factor of the core-maker, I believe it is the main variable. The method of mixing and the temperature of the drying or baking can make differences in the strength of the cores, but these are easily changed and controlled.

In some sections of the country both loamy and sharp sands may be had at about the same cost—in other sections the one or the other class is cheaper. In New England, for instance, the handy cheap sand is Beach or Bank, a sharp sand with or without clay.

In the Pittsburg district there are two kinds offered at about the same price—Bank sand, very like Millville, but finer and more sticky, and River sand, a sharp sand containing no loam. This Pittsburg combination reminds me of two core sand mixtures that I saw there a short time ago, that indicate another phase of the sand question, i. e., that each foundry thinks it has the best and only proper sand mixture for its particular class of work.

These two mixtures were being used in two foundries that were making the same kind of work and not only that, but they were casting off the same pattern for the same buyer.

In one the following mixture was used:

4 parts Pittsburg Bank sand (loamy) at $1.25 a ton
1 part River sand at $1.00 a ton
1 part old sand
1 part gluetrin at 15 cents per gallon to 100 parts sand
2 parts water added to the gluetrin before putting on the sand.

For each ton of core sand mixed the sand cost $1.00 and the binder 34 cents—a total of $1.34.

And this is the other:

3 parts River sand at $1.00 per ton
1 part flour at $25.00 per ton

For each ton of core sand mixed the sand cost $1.00 and the binder $3.84, a total of $4.84 or $3.50 more than its competitor. These are both modern, up-to-date prosperous concerns and yet the superintendent of this last plant told me that no other sand or binder could be used for that class of work.

You may say that this is an exceptional case, but I have visited foundries and seen cores and core sands in every section of the country, and, in my opinion, there is nothing exceptional about this except my luck in finding two foundries working on the same castings for the same customer. Now, if it had been similar castings for different customers I know some foundrymen who have told me that that was what made the difference in the core sands.

Frankly you make the cores out of any sands, though by that I do not mean that you can make a core out of any one sand. Sands of a loamy nature should be mixed with sharp sands and sands of varying degree of fineness used in different proportions. The same mixture that will give good results with flour will not work equally well with rosin and probably would not work at all with oil.

If you use straight fine Bank sand and the same amount of flour as the Pittsburg man used on his River sand you would get a core that would blow the casting through the roof. Open it up with a sharp sand or some old sand, reduce the amount of flour, and you will have better results, but in every case where you use a sand or a sand mixture that contains much clay you must look out for blowing—whatever your binder. If you cannot get a loamy sand, the mixing of sharp sands of different degrees of fineness and the addition of a little molding sand will give good results.

The use of three or four different binders and an equal number of sand mixtures, as is common in many foundries, is not only inconvenient but expensive. There is a foundry in eastern Pennsylvania that was using molasses, rosin, flour, two different core compounds and linseed oil. I know, because I saw those cores made and used, that they could have done all their work, by changes in their sand mixture, with flour and linseed oil at a lower cost and with not half the excitement in the purchasing department.

This question of a change in the sand affecting the binder does not seem clearly to be understood by the trade and it has resulted in the unjust condemnation of a great many binders.

Just here, perhaps, it might be well to define a good core, thus:

It must be strong both green and dry; must be weak and rotten after the casting is cooled; must not be easily affected by moisture; must give off but little gas; must draw quickly must not change in size; must have a low cost.

Now cores made of a single sand, in most cases, will not give the best results under all of these heads. If, for

[1] Abstract of a paper presented before the New England Foundrymen's Association, Feb. 14 1906.
[2] President, Robeson Process Co., Camden, N. J.

instance, a sand is too low in clay a large amount of the binder must be used to give the necessary strength and this, perhaps, will be too great a quantity to burn out during the pouring of the metal so that the core will not be weak, but hard and difficult to remove from the casting. Likewise the binder in such a core will cost entirely too much per ton of sand mixed. In such a case a mixture of sand must be made so as to add loam or clay and the amount of binder reduced.

On the other hand, if the sand contains too much clay, only a small amount of binder will be required, but the core may be like a brick and so dense and compact as to blow. In such a case add a sand containing less clay and increase the amount of binder.

This sounds in a way as very simple, but when you recollect that the size and proportions of the various sized grains have much to do with the question, as well as the clay, it is no wonder that the core maker is often puzzled over his sand mixtures or dislikes to change them once they be established to his satisfaction.

As the binders act in a different way there is here another variable brought into the story. Flour swells and pushes its way between the grains but does not move from the place where it was left in the mass by the mixing and ramming. Rosin, under the influence of the heat of the core ovens, melts and runs somewhat through the mass though a large part of the original grain remains in the last position of rest. Oil and gluetrin, because they are liquid, spread more evenly throughout the mass and over each grain during the mixing than do the solids, and when the heat is applied, thin and spread still more.

Thus the sand mixture may often have to be changed when the binder is changed if the best results are to be obtained. As an example of this the following mixture worked fairly well, though with trouble from blowing occasionally:

2 parts loamy sand
1 part sharp sand
Flour 1 to 15

Gluetrin at 1 to 50 was tried as a substitute for the flour, mainly because it was claimed that it would not blow. It did, however, both blow and scab.

The sand mixture was changed and successful results are now obtained from this:

1 part loamy sand
1 part sharp sand
Gluetrin mixed with 2 parts of water at 1 to 70

This likewise reduced the cost of the binder per ton very considerably.

In another case a foundry making small cores used the following:

5 buckets burnt cores
42 buckets gangway sand or sweepings
13 buckets coarse sharp sand
10 buckets fine Albany sand
½ bucket gluetrin, mixed in
5 buckets water

This is 1 to 35 and they complained that the cores were difficult to clean from the castings.

It was suggested that they try the following:

5 buckets burnt cores
52 buckets gangway sand or sweepings
13 buckets coarse sharp sand
½ bucket gluetrin, mixed in
5 buckets water

With this they have uniformly successful results.

The trouble had been laid at the door of the binder and if they had not been willing to make this test of a change in the sands another would have been added to the already long column of mysterious failures.

A NEW FURNACE LINING.

Robt. Dixon & Co., 710 Empire Bldg., Pittsburg, Pa., have bought out a new lining for parts of furnaces which are exposed to the hottest parts of the flame, such as soaking pit arches, blocks of crucible furnaces, back and front walls and jambs and doors of heating furnaces and bridge walls. The material is known as Dixonite, and it is stated will not shrink or expand to any degree, and can be rammed or otherwise placed when repairs are necessary.

Its analysis is as follows:

Silica	91.05	per cent.
Alumina	7.76	" "
Oxide of Iron	0.42	" "
Lime	0.34	" "

The high silica content insures ability to withstand the highest temperatures, while there is sufficent plasticity resulting from the alumina contents. Impurities injurious to all silicious substances for high temperatures are only present in small quantities, not great enough to do any harm. This material has been used at the Granite City Steel Works of the National Enameling & Stamping Co., and has been very favorably reported upon in comparison with fire bricks. Similar experiences are reported from other steel works. This material can be furnished in bricks and blocks in any shapes and sizes desired.

Consul Dudley of Vancouver writes that everything points to an increasing market in British Columbia for agricultural implements and other supplies needed by farmers. He believes that a thorough canvass by a competent salesman would largely increase the trade in American goods in that section.

ARMOR PLATE BANK VAULTS.

The Carnegie Steel Co. has just closed a contract with the Commercial National Bank, of Chicago, for the construction of the largest armor plate safety deposit vault in the world. It will be 46 feet square and nine feet high and the material to be used is the nickel steel Harveyized face hardened steel identical with that used by the United States government to protect its battleships and cruisers. In addition to this immense safety deposit vault the Carnegie Steel Co. will build for the same company a cash bank vault with interior dimensions 36 feet, by 17 feet by 9 feet high. With the construction of the vestibule to the vaults particular care has been taken, and this vestibule will be 10 feet square, walls eight inches thick and the door jams 14 inches thick, forged from one solid ingot of armor plate weighing about thirty tons. The doors at the main entrance will be eight feet in diameter, twenty-one inches thick, and will weigh seventeen tons. The inner doors will be four and one half inches thick fitted with bolted mechanism controlled by double dial combination locks.

In addition to these two vaults at Chicago the Carnegie Steel Co. has closed a contract for a bank vault for the American National Bank, Indianapolis, Ind., to be 25 feet long, 17 feet wide and 9 feet 4 inches high. This is now almost complete at the Homestead armor plate works of the company. The old vault of the American National Bank has been sold to the Hamilton Trust Co., of Philadelphia.

The new vault of the Union National Bank, Pittsburg, which will be constructed by the Carnegie Steel Co., will be 40 by 20 feet by 9 feet high.

The Bethlehem Steel Co. will build two armor plate vaults for the Girard Trust Co., of Philadelphia, the treasurers' vault to be 21 feet by 16 feet 2 inches by 18 feet 5 inches high, containing two floors. The deposit vault will be 32 feet long, 25 feet 5 inches wide and 9 feet 5 inches high. The Bethlehem Steel Co. will also build a vault 23 feet 2½ inches long, 9 feet wide and 9 feet 4 inches high for the Clearing House Association, of Philadelphia.

There are at the present time but 21 armor plate bank and safety deposit vaults in the world, and the largest of these is that of the Union Safe Deposit Co., in the Frick building, Pittsburg, 40 feet long, 20 feet wide and 6 inches thick. The contracts recently closed will bring the number up to 28, of which the largest will be that of the Commercial National Bank of Chicago.

AN INJECTOR FACTORY.

A factory should be judged by the quality of its output rather than by the quantity, and the ability of any concern to turn out a diversified product of high quality depends, to a large extent, upon the inventive and administrative genius of those in charge.

The Lee Mfg. Co., Port Huron, Mich., is not one of the largest concerns of its kind in the country, but is a progressive concern in charge of a practical man. The products of the company consist of injectors, chime whistles, air hoists and some other specialties.

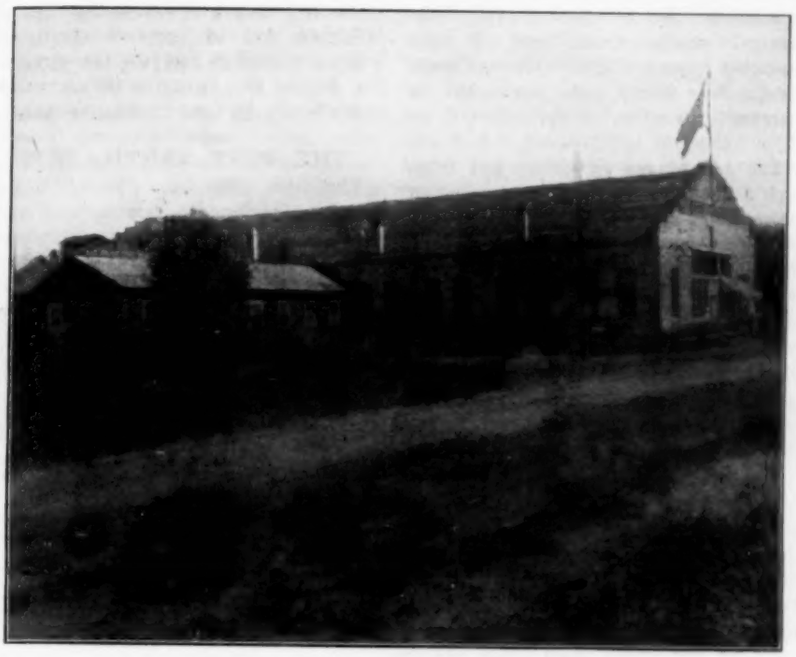


FIG. 1. EXTERIOR OF LEE INJECTOR CO.'S FACTORY.

The plant is constructed of white or Milwaukee brick, and is located in the new addition to Port Huron, being situated near the malleable department of the Port Huron Engine & Thresher Co., which has already been described in these columns.

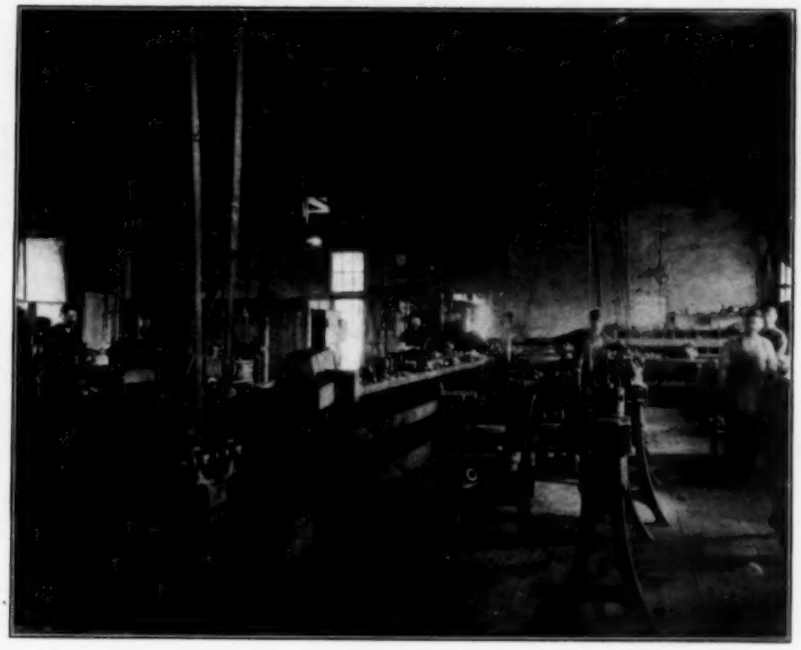


FIG. 2. INTERIOR OF MACHINE SHOP, LEE INJECTOR CO.

The foundry and testing deaprtments are in the brick addition on one side of the building, and the power plant is in the small frame addition on the opposite side.

The machine equipment consists of the latest style of turret machines and other machinery for turning out the class of work handled.

The injectors manufactured by the company range in size from the smallest injectors made to the largest which have ever been made. One of the accompanying illustrations shows the smallest and largest injectors manufactured by the company, exhibited side by side. The large injector was for one of the large power plants in Boston, and stood approximately 4 feet high. Every injector is tested before it leaves the works, and for testing, a very handy testing bench has been arranged, with adjustable couplings for steam and water, so that the injectors can be placed in the testing rack or removed very readily.

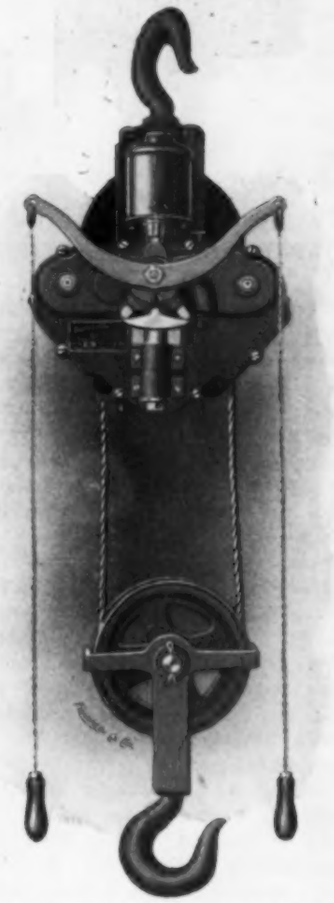


FIG. 3.—AIR HOIST MADE BY LEE INJECTOR CO.

The air hoist manufactured by this company is of the motor-driven type, and is controlled from the floor by cords. It is shown in one of the illustrations. For use on jib cranes, trolley systems, etc., a hoist of this kind is very handy. The hoist is also sometimes mounted in a different shape frame, and attached to the mast of the crane, thus converting

a hand crane into a power crane. It is tested under load in the works, both for its ability to raise the load, and for its ability to hold the load in place at any given position.

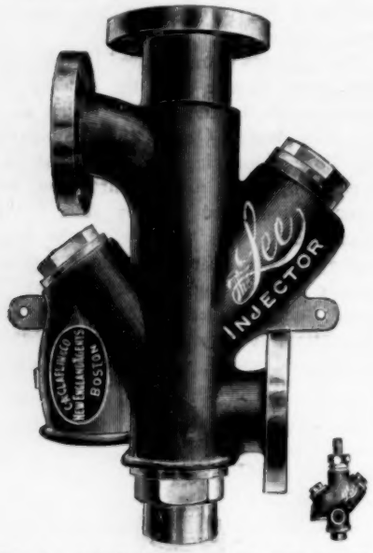


FIG. 4.—LARGE AND SMALL LEE INJECTORS.

JAPAN'S IMPORTS OF IRON AND STEEL.

The figures for Japan's foreign trade for the fiscal year 1904, contained in a report submitted by Consul General Miller, of Yokohama, show a remarkable increase in business with the United States. In that year this country purchased goods amounting to $50,000,000 in value. In sales to Japan America stands third, the amount being $29,000,000.

From Great Britain Japan purchased locomotives at a cost of $844,251, and steam boilers at a cost of $625,815. In pig iron the imports from Great Britain totaled $901,089; plate and sheet iron and steel, $793,106; tin plate, $1,157,254; galvanized sheets $580,763; nickel, $305,872; and coal, $5,612,435.

During the six months ending last June the United States led all countries in exports, taking from Japan merchandise valued at $32,518,509, and imports from this country amounted to $20,304,294. Machinery and engines reached the high figure, of $3,262,231. Other imports were: Locomotives, $387,032; iron bars and rods, $155,873; rails, $187,484; nails, $265,981; pipes and tubes, $174,948; iron and steel, $646,017.

The Interborough Rapid Transit Co. of New York has just placed an order with the Electric Cable Co. of New York for fifteen miles of cables insulated with Voltax the new high potential insulating compound which has just been placed on the market.

SWINGING CUPOLA SPOUT.

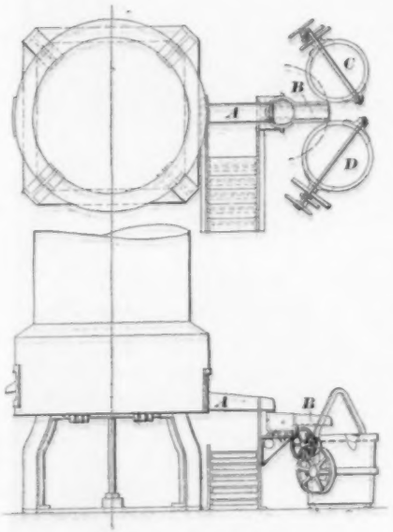
Carmil L. Clover, has invented and patented a new cupola spout which is illustrated in the accompanying cut, in which A is the regular stationary cupola spout, and B the swinging spout. By this arrangement, the stream of iron can be directed into either of the ladles, C or D.

The advantages to be derived from such a device, where a large number of crane ladles are used, will be readily appreciated by all foundrymen.

If a piece is to be cast which requires two ladles, the iron can be tapped into first one, and then the other, alternating, until both are filled. In this way, the temperature of the metal in both ladles will be more uniform, and both will have the same temperature when the time for casting arrives.

The device also reduces the amount of handling required, in changing the ladles by the ordinary method; with the ordinary arrangement, the crane brings an empty ladle, sets it down near the spout, picks up the full ladle, places it on the floor to one side, then takes up the empty ladle again, places it under the spout, and finally, picks up the full ladle, for the second time.

When the double spout arrangement is used, the crane brings the ladle and places it at one side of the one already filled. It next picks up the full ladle and the melter swings the spout to the empty ladle.



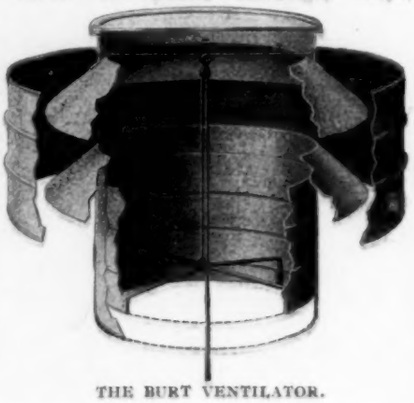
A SWINGING CUPOLA SPOUT.

It is true that in some cases, a special jib crane is placed above the cupola spout to handle the ladles in the manner mentioned, but this takes extra time, power and attention, and is at best only a makeshift.

The spout mentioned has been in use in an ingot mold foundry for over a year, and during that time, has only required lining four times, the heats averaging 120 tons per day. The spout is lined with a good grade of fire brick. In light work shops, it would not require as heavy a spout as the one illustrated, but in cases where truck ladles are used in carrying the metal to the floors, the swinging spout would undoubtedly be found advantageous.

THE BURT VENTILATOR.

The Burt Mfg. Co., Akron, O., has recently developed a new form of ventilator for public buildings, shops,



THE BURT VENTILATOR.

power houses, etc., which embodies a few new features. The most noticeable among these is a glass top which renders the ventilator a sky light in addition to its other functions. Another important feature of the ventilator is the damper which is used, this being of conical and telescopic form The construction is plainly shown in the accompanying illustration. The damper is operated from below by means of a cord or pulley; the former may be fastened at the lower end, or a counterbalance may be used to keep the damper in position. When it is desired to close it, the sliding sleeve is raised until the lower cone comes in contact with the upper, thus closing the opening and shutting off all drafts. The top is of heavy wire glass, which is set in a groove and made water tight, by means of water-proof cement. Below the glass top is a trough into which runs any condensed water which may gather on the glass. This water passes through the small holes to the outside of the ventilator, and is thus disposed of. The telescopic damper takes the place of the ordinary butterfly damper, which cuts off the light from the glass top when closed. The ventilator is made with both the conical and flat top.

Large Steel Ingot.—An ingot weighing 120 tons has just been cast at the works of Sir W. G. Armstrong, Whitworth & Co., Manchester, England, for use in the low pressure turbines of the 70,000 horsepower Cunard steamers. It is said to be the largest ingot ever cast.

Heavy Slump in Industrial Stocks.

A pronounced downward tendency, embracing practically every security actively dealt in and resulting in net declines in most cases of a number of points, held sway on the stock exchanges during the past week. Iron and steel stocks shared in the losses, though the causes contributing to the slump were chiefly outside the iron, steel and manufacturing field. Among the factors leading to the decline the two of foremost importance were the ending of the so-called "copper war" and the declaration by the Union Pacific of its semi-annual dividend on the common stock. In both instances these securities promptly sold up several points on the announcement of the deals and then just as rapidly began to decline, the apparent reason being that the good news had been more than properly discounted and that the actual development was in the nature of a disappointment. The copper stocks led in the decline and the end of the week saw trading, though active, extremely weak with prices near the lowest for some time. The absence of any definite forecast of the mining future had a tendency to minimize anything but liquidation; interest rates both for call and time loans were unusually high for this period of the year with prospects of continuance in the announcement of heavy bond issues shortly to be made; and the weekly bank statement showed a reserve still further decreased with a corresponding increase in loans. All these were elements of a weakening nature and the net declines of the week were heavy. Total sales were 5,327,700 shares. Union Pacific sold 718,400 shares with a net loss of five points, Amalgamated Copper declined the same with sales of 682,900 shares, Steel preferred and common each lost three and one-eighth points on total dealings of 600,000 shares. Colorado Fuel & Iron closed almost ten points lower on sales of 129,200 shares and Tennessee Coal & Iron and Sloss-Sheffield each lost five points on moderate dealing.

FINANCIAL NOTES.

The Wheeling Iron & Steel Co. has authorized a stock dividend of 18 per cent and in addition has declared a cash dividend of 2 per cent. The additional stock dividend raises the capitalization to $5,000,000.

The New York Stock Exchange has admitted to trading $600,000 addition mortgage 5 per cent bonds of the Tennessee, Coal, Iron & Railway Co., making the total amount listed to date $4,424,000, and $2,098,000 addition coupon bonds of the Reading Co. and the Philadelphia & Reading Coal & Iron Co., maturing in 1997, making $$68,330,000 in all.

THE LEADING INDUSTRIAL SECURITIES.

	Closing Quotation Feb. 10	Closing Quo. Feb. 17	Changes	Date of 1906 Ann. Meet.	Par Value	Capital Outstanding	Dividend Basis	Dividend Being Paid	Dividend Date Last Div. Dec.
Allis-Chalmers Co	24	22⅜	—1⅝	Sept.	100	19,820,000	7 cum	.....	.....
Allis-Chalmers preferred	63½	62	—1½		100	16,150,000		.....	Feb., 1904
AmericanCan	10	10	.....	Apr. 24	100	41,233,300	7 cum	.....	.....
AmericanCan preferred	69¾	69	— ¾		100	41,233,300		*5 Q.	Jan., 1906
AmericanCar and Foundry	44⅛	42⅜	—1⅞	June 28	100	30,000,000	7 n. c.	.....	May, 1905
AmericanCar and Foundry preferred	103	102	—1		100	30,000,000		7 Q.	Jan., 1906
AmericanLocomotive	75⅛	71⅞	—3⅜	Oct. 16	100	25,000,000	7 cum	.....	.....
AmericanLocomotive preferred	116½	116	— ½		100	24,100,000	4	7 Q.	Jan., 1906
American Shipbuilding	57⅛	57⅜	+ ½	Oct. 2	100	7,600,000	7 n. c.	4 Q.	Dec., 1905
American Shipbuilding preferred	107	107	.....		100	7,900,000		7 Q.	Jan., 1906
American Steel Foundries	12⅞	11⅛	—1⅜	Oct. 3	100	17,700,000	6 cum	.....	.....
American Steel Foundries preferred	49½	47¼	—2¼		100	17,700,000		.....	Aug., 1905
Barney & Smith	25	25	.....	June 5	100	1,000,000	8 cum	.....	June, 1894
Barney & Smith preferred	126	125	—1		100	2,500,000		8 Q.	Dec., 1906
Bethlehem Steel	32	31	—1	April 3	100	15,000,000	7 n. c.	.....	.....
Bethlehem Steel preferred	91	90	—1		100	15,000,000	6	7 Q.	Feb., 1906
Bullock Electric preferred	114	114	.....	Oct. 2	100	1,000,000	6	6 Q.	Jan., 1906
Cambria Steel	36¾	35¾	—1	March 20	50	45,000,000	4	3 S. A.	Feb., 1906
Cambria Iron	49½	49½	.....		50	8,468,000	7	4 S. A.	Jan., 1906
Colorado Fuel & Iron	72	62¼	—9¾	Oct. 15	100	30,132,000	5	.....	Apr., 1902
Wm. Cramp & Sons Ship & Eng. Bldg. Co.	25	24	.....	May 31	100	6,098,000		.....	Nov., 1902
Crucible Steel	16¾	15⅝	—1⅛	Oct. 17	100	25,000,000	7 cum	.....	.....
Crucible Steel preferred	79¾	77½	—2¼		100	25,000,000		.....	Sept. 1903
Empire Steel	7½	7½	.....	Feb. 28	100	2,281,400	6 cum	.....	.....
Empire Steel preferred	37	37	.....		100	2,500,000	5	3 S. A.	Jan., 1905
Fay & Egan	95	95	.....	Feb. 20	100	1,000,000	7 cum	5 Q.	Nov., 1905
Fay & Egan preferred	120	120	.....		100	1,000,000	8	7 Q.	Nov., 1905
General Electric	175	170	—5	May 8	100	48,256,050		8 Q.	Jan., 1906
International Pump	35⅜	34	—1⅜	June 5	100	12,202,500	6 cum	2	July, 1905
International Pump preferred	83½	80	—3½		100	8,850,000		6 Q.	Feb., 1906
Lackawanna Steel	81	80	—1	March 14	100	34,971,400		.....	
Lake Superior Corporation	20½	20	— ½	Oct. 3	100	40,000,000	6	.....	
Niles-Bement-Pond	121	119	—2	Feb. 7	100	5,000,000	6 cum	6 Q.	Feb., 1906
Niles-Bement-Pond preferred	103⅜	106	+2⅜		100	2,000,000		6 Q.	Mch., 1906
Otis Elevator Co	58	57	—1	March 19	100	6,350,300	6 n. c.	2 A.	Apr., 1905
Otis Elevator Co. preferred	106	104	—2		100	5,589,500		6 Q.	Jan., 1906
Pittsburg Coal Co	16	15½	— ½	Feb. 12	100	30,135,000	7	.....	
Pittsburg Coal preferred	58	55⅛	—2⅞		100	30,716,200		.....	Apr., 1905
Pressed Steel Car	62⅜	58⅞	—4½	Feb. 21	100	12,500,000	7 n. c.	3	Aug., 1904
Pressed Steel Car preferred	102⅞	100½	—2⅜		100	12,500,000		7 Q.	Feb., 1906
Pullman Palace Car	240	238	—2	Oct. 18	100	74,000,000		8 Q.	Feb., 1906
Railway Steel Spring	60¼	56	—4¼	March 1	100	13,500,000	7 cum	4 S. A.	Oct., 1905
Railway Steel Spring preferred	106	104½	—1½		100	13,500,000		7 Q.	Dec., 1905
Republic Iron & Steel	35	32	—3	Oct. 17	100	27,352,000	7 cum	.....	.....
Republic Iron & Steel preferred	107¾	105	—2¾		100	20,852,000	5	7 Q.	Apr., 1906
Sloss-Sheffield	89	84	—5	March 14	100	7,500,000	7 n. c.	5	Jan., 1906
Sloss Sheffield preferred	108	108	.....		100	6,700,000		7 Q.	Jan., 1906
Tennessee Coal & Iron	157	152	—5	May 15	100	22,552,800		4 Q.	Jan., 1906
U. S. Cast Iron Pipe & Foundry	49	45⅛	—4⅛	June 27	100	12,500,000	7 n. c.	2	Jan., 1906
U. S. Cast Iron Pipe & Foundry preferred	94¼	93	—1¼		100	12,500,000		7	Feb., 1906
U. S. Steel	44⅝	41¼	—3⅜	April 16	100	508,302,500	7 cum	.....	Dec., 1903
U. S. Steel preferred	109½	106⅜	—3⅛		100	360,281,100	5	7 Q.	Feb., 1905
U. S. Steel 5's	99¼	99	— ¼		100	463,798,000		5 A.	
Virginia Iron, Coal & Coke	53½	46	—7½	Sept. 18	100	8,641,600	10	.....	.....
Westinghouse Electric	165	161	—4	June 27	50	20,996,350	20	10 Q.	Jan., 1906
Westinghouse Air Brake	156	156	.....	Oct. 2	50	10,990,450		20 Q.	Jan., 1906

NEWS FROM MANY INDUSTRIES.

New Buyers:—

The Buffalo Crucible Casting Co., Buffalo, N. Y., has been incorporated with a capital of $150,000 to manufacture crucible steel castings. The directors are: W. A. Torne, E. G. Ripple of the Buffalo Foundry Co., and J L. Osgood of the Erie County Bank building, Buffalo.

The Connellsville Machine & Car Supply Co., Connellsville, Pa., has been incorporated with a capital stock of $15,000. The directors are: Logan Rush, Uniontown; J. Donald Porter, Herman M. Kephart, Charles F. Hood and Grant Myers.

The Avonmore Cast Steel Co., Uniontown, Pa., has incorporated under the laws of Delaware for $50,000. The incorporators are: John P. Conn, E. A. Hibbs and J. A. Baer, all of Uniontown.

The Yuma Coal & Coke Co., Logan, W. Va., has been incorporated for $75,000 to mine coal and manufacture coke. The incorporators are: W. H. Barlow of Logan, Andrew Robertson of Pittsville, Pa., and George W. Robertson of Shamokin, Pa.

The J. C. Mire Implement Co., Ltd., New Orleans, has been incorporated for $100,000. The officers are: C. D. Goncran, president, J. C. Mire, vice president, and William T. King, secretary and treasurer.

The Eureka Mfg. Co., Lincolnton, N. C., has incorporated for $25,000 to operate a machine shop and foundry. The officers are: J. L. Lineberger, president; W. A. Biggs, secretary, treasurer and general manager.

The Wysox Iron Co. of Duluth, Minn., has been incorporated with a capital stock of $500,000. The incorporators are: William Elder, Arthur Howell and M. E. Riley.

The Hector Iron Co., Duluth, Minn., has been incorporated with a capital of $100,000. The incorporators are: A. L. Agatin, James Wanless and Lee W. Farmer.

The William E. Williams Co., Wilmington, Del., has been incorporated with a capital stock of $30,000 to manufacture, sell and deal in manufacturing appliances of all kinds.

The Phoenix Boiler Works, Terra Haute, Ind., has been incorporated with a capital stock of $10,000 to deal in boilers, engines, etc. The incorporators are: Edward F. McElfresh, Mary McElfresh and Fred A. McElfresh.

The Bloomdale Mfg. Co., Bloomdale, O., has been incorporated with a capital stock of $10,000. The incorporators are: G. M. Book, C. R. Campbell, R. A. Emerson, J. L. Van Eman and L. R. Snider.

August Schmitt & Sons, Evansville, Ind., have been incorporated with a capital stock of $15,000 to manufacture tin, copper and sheet iron ware.

The Faulkner, Laugenour & Peart Co., Woodland, Cal., has been incorporated for the manufacture of farming and other implements. The incorporators are: D. A. Faulkner, B. G. Peart and P. T. Laugenour.

George W. Miller & Co., Wilkinsburg, Pa., has been incorporated with a capital stock of $100,000 to manufacture, sell and deal in railway supplies of all kinds. The incorporators are: Alfred L. Bennett, George W. Miller, Wilkinsburg; Samuel S. Miller, Fairchance, Pa., and George W. Miller, Pittsburg, Pa.

The following Canadian companies have been incorporated: The Pratt & Whitney Co., Ltd., Dundas, Ont., $100,000 to manufacture machinery, tools etc.; incorporators: Robert C. McKinney, Lucius B. Morgan, Charles L. Cornell, Henry Bertram and Alex. Bertram; Darling Bros., Ltd., Montreal, $250,000, to manufacture iron and steel goods; incorporators: Arthur J. Darling, Geo. Darling, Edward Darling, Geo. H. Butcher and G. W. McDougall; Reinforced Concrete Co., Ltd., Montreal, $200,000, Donald Loynachan, Timothy J. Donoghue, John T. Bethune, Arthur W. Powell and J. L. Goffette; The Anthony Wire Fence Co. of Canada, Ltd., Windsor, $100,000; provisional directors: Daniel P. Anthony, Theodore C. Harris, John C. Hitcsher, James W. Nixon and Chas. B. Anthony; The Capital Scale Brass & Iron Foundry Co., Ltd., Ottawa, $40,000; provisional directors, Robt. B. Gounan, Frederick M[illegible]er, Albert E. Dittman, Louis J. Kehoe and Edward P. McGrath.

New Construction:—

The A. Garrison Foundry Co., Pittsburg, is building an addition 100 by 100 feet, equipped with a 50-ton crane, to be used as a machine shop to take care of its increasing business in the lines of presses and stamping machines. The new building is well under way and will be completed March 15.

The Perry Machine Works, Norfolk, Va., recently incorporated, will erect a brick factory, manufacturing saw mills and other machinery, operating a machine shop and dealing in boilers and engines. T. A. Perry is president and general manager.

The Landis Tool Co., Waynesboro, Pa., has decided on a large extension to its machine shop for which considerable machinery will be required.

The Griffin Wheel Co., of Chicago, has let the general contract for the erection of its new plant at Kensington, Ill., to the R. & S. Sollitt Co., Chicago. The plant will comprise a main building, housing a number of departments, a power building and several smaller structures.

The New England Boiler Co., New London, Conn., which was recently incorporated, will build a plant 64 by 200 feet, and equip it with a number of machine tools and other machinery, although no contracts have been let. Both the building and equipping of the plant are in charge of Ransom & Hoadley, 601 Butler Exchange, Providence.

George McClure & Sons, Pittsburg, have completed the foundations for the blast furnace which they are erecting for the Kittanning Iron & Steel Co., at Kittanning, Pa.

The Kemmerer Iron & Steel Mills Co., Scranton, Pa., recently incorporated with a capital stock of $150,000, has purchased the old south mill property of the Lackawanna Iron & Steel Co. It will add an entirely new mill which will be equipped with the latest machinery. About $100,000 will be expended in installing the plant for the rolling of iron and steel.

The United States Steel Corporation is already well along with many of the improvements recently authorized by the board of directors and financial committee. This is particularly true at the Homestead plant where the little village of Pottersville, which was erected within the confines of the big fence during the strike ten years ago, has been razed and is now a thing of the past, and a large force of workmen are at work erecting the new open-hearth plant and making preparations for the reception of the new plants to be installed.

The Acme Steel & Malleable Iron Works, Buffalo, N. Y., has practically completed a large addition to its foundry which will increase its present capacity to about 10,000 tons.

The Baker & Shevlin Co., Saratoga Springs, N. Y., has practically completed a 40 by 108 feet addition to its foundry which will increase its malleable iron capacity 20 per cent.

The Bridgeport Foundry Co., Bridgeport, Conn., is planning the erection of a new machine shop, 50 by 100 feet.

The Lenoir City Car Works, Lenoir City, Tenn., has increased its capital

stock from $200,000 to $250,000, and will make additions to the plant which will enable it to turn out about 20 cars per day.

The Van Buren, Heck & Marvin Co., manufacturing of ditching machines, Findlay, O., has taken out a permit for an additional building.

The Superior Steel Co., Carnegie, Pa., is to erect a two-story office building at a cost of $10,000. L. K. David, an architect of Leetsdale, Pa., is in charge.

The Pittsburg Coal Co., has decided to extend its coke operations and to this end will open a mine and construct 500 coke ovens in the Redstone district, where it has about 8,000 acres of coking coal land and a small plant.

The Steel Car Forge Co., Ellwood City, Pa., is constructing a brick and steel manufacturing plant. The McClintic-Marshall Construction Co., Pittsburg, has secured the contract for the steel work.

The Standard Sanitary Mfg. Co., Louisville, Ky., will erect a four-story shipping and office building, a brass foundry and a number of smaller structures.

The Chicago Tool Co., Franklin, Pa., is planning an addition 80 by 150 feet to its machine shop.

The Buckeye Fire Brick & Clay Co., Scioto Furnace, O., is to construct five new kilns. E. P. Stevens is general manager.

Improvements now under way at the plant of the Joliet Bridge & Iron Co., Joliet, Ill., will cost about $50,000.

The LaCrosse Stamping & Tool Co., LaCrosse, Wis., has prepared plans for a two-story factory 52 by 150 feet.

The Cambria Steel Co., it is reported, will build 100 ovens near Gallitzer, Pa.

The Eastwood Wire Mfg. Co., Belleville, N. J., is to construct a new machine shop 60 by 125 feet, and will use its present building as a valve shop.

Fires:—

D. D. Flanner, president of the Toledo Boiler Works Co., Toledo, O., reports that the company's loss in its recent fire was in the neighborhood of $10,000. The main structure was destroyed, but the damage to stock and machinery was slight. Rebuilding will be begun at once.

The Portsmouth Stove & Range Co., Portsmouth, O., which places its recent loss by fire at $150,000, will rebuild probably on a more extensive scale.

Fire caused a damage of about $20,000 at the plant of the National Enameling & Stamping Co., St. Louis, Feb. 6.

The machine and blacksmith shops of McDonald & Brennan, Bolivar, N. Y., sustained a loss of $2,500 by fire Feb. 6.

Fire in the boiler house of the E. D. Jones' Sons Co., Pittsfield, Mass., Feb. 7, caused a considerable loss.

The Bellefontaine Bridge & Iron Works, Bellefontaine, O., will rebuild the plant recently destroyed by fire.

General Industrial Notes:—

The Lukens Iron & Steel Co., Coatesville, Pa., reports its output of finished plates for 1905 as 168,000 tons. Its output at present is at the rate of over 200,000 tons of finished product, and still further increases are planned. In January over 19,000 tons were turned out. The contract for the building and equipment of machinery for its new open-hearth extension has been let.

The Union Iron Works Co., which recently incorporated at Selma, Ala., did so only for the reason of increasing its capital stock. It has been in business about 30 years.

The Monarch Coal & Coke Co., Bristol, Va.-Tenn., recently incorporated for $50,000, does not expect to enter actively into the coke business before next year. It has already begun the work of developing a 1,000 acre tract of coal land in Lee county, Va., and expects to mine 1,000 tons of coal per day. The company will construct about 20 tenement houses, power house, commissary building and other mine structures. Little of the mine equipment has yet been purchased. C. D. Caldwell is president and U. K. Custred is engineer.

James McCarren & Sons, proprietors of the Rockford Steam Boiler Works, Rockford, Ill., have leased to Donald McDonald, of Chicago, the Hopke foundry for one year. It is understood extensive improvements will be made on the plant.

The old Riverside nail mill at Wheeling, W. Va., which has been standing idle for a quarter of a century, is now being torn down and dismantled. The old machines which have been standing in the building since the passing of the business are being broken up and will go to the scrap pile.

The production of pig iron in Germany and Luxemburg for 1905 was 10,987,623 metric tons as compared with 10,103,941 tons in 1904. Basic Bessemer pig iron contributed 7,114,885 tons to this total, foundry iron 1,905,668 tons, acid Bessemer 425,237 tons, mill iron 827,498 tons and various brands of spiegeleisen 714,335 tons.

Cambria furnace No. 7 of the Cambria Steel Co., Johnstown, Pa., is in full operation with an estimated capacity of 150,000 tons yearly.

Hobson & Co., manufacturers of agricultural implements and vehicles, have begun operations in their new plant at Evanston, Pa. Their New York office is 17 State street.

The Automatic Metal Turning Co., recently incorporated, will take over the business of the Lewis H. Dodge Co., Boston, and will continue to operate the plant at 148 Purchase street, manufacturing screws, nuts and screw machine goods.

Stockholders of the McKeesport Tin Plate Co., McKeesport, Pa., have re-elected officers as follows: E. R. Crawford, president; E. P. Douglass, vice president; H. M. Clark, secretary; W. L. Curry, treasurer, and J. E. Lauck, general manager. The record of the tin plate mill for January was 2,682 tons of black plate, the largest in the history of the plant.

Geo. Barcus & Co. of Wabash, Ind., have purchased the interests of B. F. Burk and Philip Matter in the Gemmer Engine Co., Marion, Ind., and will remove the plant to Wabash where it will be consolidated with the Barcus foundry. A number of changes in the latter plant will be necessary.

Thomas D. Cone has purchased from J. F. Zahm the latter's interest in the Ohio Steel Wheelbarrow Co., of Toledo, and has been chosen secretary and treasurer in which capacity he will devote his entire attention to the business.

The rod mill of the Pittsburg Steel Co. at Monessen, Pa., in 52 12-hour turns produced 14,052 gross tons of rods, or an average of 605,000 pounds a turn.

The Southern Saw Works, Atlanta, Ga., has been re-organized and is planning to increase the capacity of the present plant. E. A. Werner, formerly connected with the Sloss-Sheffield Steel & Iron Co., the Semit-Solvay Co. and the South Sharon Steel Works, has been elected president and general manager.

The Marinette Iron Works Mfg. Co., which recently moved its plant from Marinette to Chicago Heights, Ill., is in the hands of a receiver. An attempt will be made to re-organize the concern on a stronger basis, as insufficient capital is said to have been the cause of the failure.

The Chapman Valve Mfg. Co., of Indian Orchard, Mass., one of the largest valve and hydrant concerns in the country, has declared in favor of the open shop.

The Acheson Mfg. Co. has purchased the plant of the Bailey-Farrell Mfg. Co. at Rankin Station, a suburb of Pittsburg. Geo. R. Acheson, president of the company, and Fred W. Robertshaw, superintendent of the Bailey-Farrell plant, will continue the

business of manufacturing lead pipe, sheet lead, brass fittings, etc.

The Pilgrim Foundry Co. has removed from Seaside, Mass., to South Boston, Mass.

The new furnace of the Bird Iron Co., near Ironton, O., was lighted Feb. 12.

The National Cutlery Co., Detroit, Mich., has its new plant well under way. When completed it will afford almost 50,000 square feet of floor space for factory purposes. The capacity of the company will be 900 dozen articles of cutlery per day.

The J. B. B. Collieries Co., which is now operating three mines in the Pocahontas field at Marytown, W. Va., is arranging to open up four new plants, and is figuring on a large central power plant to take care of a number of mines in that neighborhood. It will need dynamos, both alternating and direct, as well as considerable mining equipment, including cars and fans. H. M. Jewett is president.

The Sterling Coal & Coke Co., Sharon, Pa., will build a coke plant with 300 ovens in a town to be known as Mt. Sterling. The company expects an annual coke capacity of about 180,000 tons.

The Compania Minera de Fierro del Pacifico, it is reported, will establish an iron and steel plant in the city of Michoacan, Mex., where it has quite extensive iron ore deposits. William W. Miller, Guadalajara, Mex., is at the head of the company.

Two furnaces of the Pennsylvania Swedish Iron Co., at Cheswick, Allegheny county, Pa., have been started. Work on the plant was begun in November. The plant is equipped with two scrap furnaces, one continuous heating furnace, and one 16-inch train of rolls, with an annual capacity of 25,000 tons of charcoal boiler tube skelp iron, scrap iron, low phosphorus bars, high grade merchant bars and stay bolt iron. A charcoal forge is being built; puddling furnaces and muck and plate trains for the manufacture of charcoal iron, plates and sheets will be added later.

The Cyclone Drilling Co., Orville, O., which recently took over the factory of the Presslar-Crawley Mfg. Co. of Cincinnati, will immediately enlarge its plant to care of the new equipment which it will install. It will manufacture the complete line of the Presslar-Crawley Co. in connection with its own drilling machinery, as well as a number of engineering devices including well packers, anchor bolts, etc. In addition it will build a combination machine embodying both the hollow rod and core features. With this the prospector will be enabled to test coal lands or mineral properties, drilling the barren portion or overlying strata with the churn drill or hollow rod machine, and coring the bottom or ore bearing part of the hole, not only reducing the cost of drill work very materially, but securing the same practical test as with a core drill using it from top to bottom.

At the annual meeting of the American Screw Co., Providence, R. I., the following directors were re-elected: Charles B. Humphrey, Charles Alexander, George H. Robinson, George L. Shepley, Samuel M. Nicholson, Marsden J. Perry and Arthur A. Watson. The following officers were chosen by the directors: President, Samuel M. Nicohlson; vice president, Marsden J. Perry; treasurer, George W. Thurston; secretary, William A Cranston; superintendent, Benjamin Thurston; agent, James A. Nealey; sales agent, William G. Smythe.

The Allis-Chalmers Co., Milwaukee, will furnish another 44-inch and 84-inch by 60-inch vertical standard, long crosshead furnace blowing engines for installation at the Radford furnaces, Radford, Va. The National Tube Co., Pittsburg, will install about June 1, another Allis-Chalmers rolling mill machine at its McKeesport mills. This will be of the horizontal tandem compound type, with high and low-pressure cylinders, 35 by 54 inches diameter and 60 inches stroke. The Edison Portland Cement Co., Stowardville, N. J., will install two Allis-Chalmers engine units, having them ready for operation in May.

Information Wanted.—The Bureau of Labor of the Department of Commerce and Labor is preparing a report covering the various systems of workingmen's insurance and employers' liability both in this country and abroad. The report will cover insurance against sickness, accident, disability, old age and unemployment. The bureau is endeavoring to secure information concerning the existence in the United States of what are usually known as establishment funds,—that is, mutual relief or insurance funds organized and maintained by the employes of an industrial establishment, or relief funds supported either wholly or in part by the employers themselves. It is desired to obtain, wherever possible, copies of constitutions, rules and by-laws, blank certificate forms and any other matter relating to funds of this character, or in the absence of other data, the names and locations of establishments in which such funds exist are desired. This may be addressed to Chas. P. Neill, commissioner, Bureau of Labor, Washington.

TRADE PUBLICATIONS.

The Ohio Structural Iron Co., Sandusky, Ohio, is distributing a catalog of 40 pages in which it illustrates and describes various forms of ornamental iron work, gates, fencing, etc.

The Watson-Stillman Co., 46 Dey street, New York, has just published catalog No. 68. This is another edition of catalog No. 61, and relates to hydraulic jacks. It contains a few pages of new matter, relative to low type journal box hydraulic jacks, pipe pulling ring wedges and faces, bridges, transfer hydraulic jacks and a jack repair vise.

The Jeffrey Mfg. Co., Columbus, O., has issued bulletin No. 11, entitled "The Application of Electricity to Mining." The catalog consists of 24 well illustrated pages, and compares the use of electricity in mines with other forms of motive power. The illustrations consist of various machinery which may be used, together with photographs of actual installations.

The Lodge & Shipley Machine Tool Co., Cincinnati, has issued Catalog R., describing the complete line of lathes which it manufactures. These range from 14-inch to 48-inch engine lathes; a number of turret engine lathes, patent head lathes and screw machines are also described. Various portions of different machines are illustrated and described in detail. The catalog is a handsome publication of 98, 6 x 9 pages.

The Hyatt Roller Bearing Co., Harrison, N. J., has issued Bulletin No. 28, entitled: "A Brief Mechanical Statement of Facts, Explaining the Hyatt Roller Bearing." This is a publication of about 45 pages, and takes up the mechanical advantages of the Hyatt bearing. It describes various forms of other bearings, both of the ball and roller type, and then explains the Hyatt bearing in detail. Another section deals with the principal applications of the Hyatt bearing, and gives a report of a competitive test between the Hyatt roller bearing and the ordinary babbitted bearing.

Largely Increased Business.—The American Iron & Steel Mfg. Co., Lebanon, Pa., reports that in 1905 it had more customers, more orders and shipped a greater value of product than ever before in its history. During the year $175,060.55 was spent for betterments and extensions, the regular dividends on common and preferred stock were met, $50,000 was added to the reserve fund to provide for depreciation of buildings and machinery, and the company was able to carry forward a surplus of $359,633.42, making the undivided profits Dec. 31 last $650,462.69.

NAME OF MINE.	1893-94	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	TOTALS.
Mesabi Range												
Adams	1,140									1,370		1,370
Aetna (Lowmore)		27,931	110,821	98,847	104,510	93,025	119,940	63,429	110,993	107,886	81,164	1,056,941
Agnew	44	2,107										13,921
Ajax (Kanawha)	28,38,209	183,296	95,809	149,594	295,821	337,807	404,645	477,212	646,203	522,035	374,944	4,490,305
Albany	241	2,045						18,750	100,564	31,901	16,577	247,061
Alexander	15							17,326	61,664	123,236	151,114	453,566
Auburn												34,055
Bessemer	112					80,915	51,639	36,593	129,035	246,581	132,420	964,535
Biwabik	1,092									2,088	4,242	16,578
Burt	1,860 35,895	618,589	420,318	643,402	724,768	940,513	929,937	929,701	956,812	704,051	541,324	13,404,416
Canton	10,300	70,967	87,202	24,623	14,199	126,290	97,531	19,963	186,798			942,703
Cass	5974,921	208,880	93,707	98,283	250,687	117,296	53,342	77,799	112,704	5,051	1,617	2,454,651
Chisholm	231	15,037	44,526	96,210	128,233	147,346	197,770	230,614	195,555	117,096	180,983	1,507,940
Cincinnati						20,210	38,209					58,419
Clark	358		3,395	41,942	76,877	100,902	141,148	178,800	183,052	111,851		837,967
Cloquet (Vega)			52									83,770
Columbia	1				5,009	10,980	49,203					65,192
Commodore	1462 4,538	90,885	47,081	31,062	49,381	7,458			2,816	5,365		1,086,178
Corsica	2,726	22,829	35,136	37,594	93,663	74,235	35,756	15,395	130,798	95,877	153,452	1,988,060
Croxton	130										11,988	11,988
Cyprus	235								14,455	61,694	132,380	285,899
Day			14,643		33,851	43,316	98,550	123,261	42,470	100,751	68,318	1,089,525
Duluth	142							11,444	7,599	1,294	4,737	26,123
Elba	125	949	94,645	96,032	69,865	110,269	72,413	149,966	123,331	79,420	136,232	1,169,885
Fayal	1,358	1,201					11,008	20,355	74,596	53,828	38,288	210,663
Forest	99					3,496	6,410	2,503				12,409
Franklin									3,373	7,339		28,530
Frantz	70	19,441				4,900						93,101
Genoa	281 2,600					67,652	31,323		47,267	43,736	29,393	423,271
Glen	287					43,622	72,959	19,727	7,747	15,606	17,577	233,366
Grant	4965,983	53,160	34,334	54,104	68,447	64,824	61,219	54,985	128,300	87,939	54,720	844,884
Hawkins	202			37,182	60,739	86,607	90,155	74,113	31,181	51,440	79,163	756,120
Hector (Hale)	4	23,733	60									425,708
Higgins	238 77	1,071		216					53,272			113,229
Holland	1583,062	10,924	21,815	10,374	17,430	15,194	14,922	12,133	25,935	40,860		298,550
Hull	233							2,397				9,310
Iroquois	61									8,739	32,332	133,254
Jordan	185										9,086	227,890
Kinney	83								1,324	17,280		35,810
La Belle	78						1,316		10,383	9,863	11,257	267,163
Lake Sup. Group	75,274	290,622	179,917	237,886	223,713	229,651	197,606	358,126	273,443	343,543	141,948	3,555,423
La Rue	1994,010	262,551	272,587	279,855	305,072	530,129	374,043	507,786	530,291	489,175	372,791	5,135,219
Laura	27	761				11,060	25,967	66,383	62,531	49,708	33	499,756
Leetonia	353					2,262	71,004	119,860	215,850	97,633	81,543	670,763
Leonard	267	16,754	3,419	146		31,104	8,063					116,299
Lincoln	275							18,957	55,238	45,386	113,669	399,779
Longyear	16						5,143	11,475	43,245	50,910	20,202	130,975
Mahoning	1,011								40,384	12,122	81,354	224,286
Malta	139											10,296
Miller	118	13	661									151,425
Minorca	117 354	2,561										6,482,220
Monroe	13											
Morris	1,07837,949	1,923,798	1,560,467	1,937,013	2,522,265	3,301,052	3,261,221	3,619,053	4,612,509	3,749,567	3,074,848	53,567,397
Morrow	6											
Mtn. Iron	2,496								5,007	29,718		57,451
Myers	188						1,583	4,338	59,781	134,648	25,781	354,654
Norman	32,171	44,140		2,519								92,639
Ohio			587									62,542
Pearce										7,854	9,869	17,723
Penobscot	47,218	41,656	95,086	110,648	102,623	124,930	80,432	68,907	63,976	41,168	84,852	1,639,152
Pettit	1442,788	100,398	113,375	141,728	163,190	215,074	113,743	99,026	205,721	74,238	174	4,160,289
Pillsbury	161			3,975			22,585	22,815	24,874	6,786		339,426
Roberts	43,706	221,153	513,119	718,408	869,482	1,011,048	881,021	860,484	1,104,864	810,845	743,363	14,411,640
Rust	27 21,740	13,752	18,903	1,154			27,987	31,686	38,761	22,523	7,269	327,604

THE IRON TR

TABLES SHOWING LAKE SUPERIOR IRON ORE SHIPM

NAME OF MINE.	1905	Prior to 1888	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	TOTALS.
Mesabi Range																				
Adams	1,140,984									59,141	234,562	170,738	390,860	720,474	777,346	829,118	1,242,923	1,109,750	940,105	7,616,001
Aetna (Lowmore)								1,645			17,723						196,316			215,684
Agnew	44,651																45,582	108,847	96,435	295,515
Ajax (Kanawha)	28,439																24,829	23,932	912	198,593
Albany	241,186													14,963	64,218	41,300		109,608	153,433	504,227
Alexander	15,073																			15,073
Auburn									108,210	376,970	131,478	175,263	235,630	385,992	263,692	427,510	38,283		86,303	2,143,028
Bessemer	112,630																			198,933
Biwabik	1,092,987							151,500	90,048	247,069	242,565	427,464	383,180	583,836	924,868	410,074	623,127	807,511	647,614	6 001,843
Burt	1,860,452																			1,860,452
Canton								24,416	213,853	359,020	16,261			99,498						713,048
Cass	59,552																	50,155	29,554	139,261
Chisholm	231,296															34,573	200,629	168,831	130,732	766,961
Cincinnati	965							26,372		17,187	57,324	32,912		246						135,006
Clark	358,091														63,071	199,566	350,799	300,492	256,873	1,528,892
Cloquet (Vega)									5,628	47,700	96,280	12,215		1,621						163,444
Columbia	1,360															15,627				16,987
Commodore	146,901							65,137	7,313		22,063	60,798	80,494	152,947	278,416	35,546	65,833	20,436	249	936,033
Corsica																26,838	59,292	34,043	30,131	150,304
Croxton	130,228																18,594	100,297	348	249,467
Cyprus	235,351																	121,818	244,343	601,512
Day														18,651	1,975			107,781	84,530	319,453
Duluth	142,172							37,626						112,155	165,435	128,587	106,516	150,053	149,819	1,186,091
Elba	125,724													564	9,547	121,707	150,220	93,616	123,425	906,667
Fayal	1,358,922									136,601	248,645	642,939	575,933	1,072,257	1,252,504	224,630	207,454	975,102	1,289,649	11,299,649
Forest	99,785															1,656,973	1,919,172	1,460,601	85,280	185,065
Franklin																			65,528	1,554,508
Frantz	70,210							46,617	223,399	286,423	231,086	30,128	200,400	60,000	168,524	39,269	111,085	92,019	62,884	133,094
Genoa	281,081																			2,697,209
Glen	287,835										17,136	309,514	279,677	276,559	253,651	332,022	349,719	303,700	244,150	763,827
Grant	49,227																23,875	171,705	280,412	164,514
Hawkins	202,070																51,946	18,928	44,413	414,922
Hector (Hale)	4,996																5,892	107,905	99,055	284,437
Higgins	238,598							3,616	24,167	31,004	70,006	13,728		18,807	32,901	30,929	54,289			273,884
Holland	158,484																		35,286	158,484
Hull	233,065																			253,065
Iroquois	61,109																	17,562	50,215	128,886
Jordan	185,854																147,931	190,024	97,474	621,283
Kinney	85,161																	32,352	6,225	127,738
La Belle	78,597																70,753	48,288	89,554	287,202
Lake Sup. Group										58,123	67,659	259,912	135,404	154,326	284,023	594,761	766,311	1,226,066	1,415,884	4,962,469
La Rue	197,192																	53,335	105,179	355,697
Laura	27,207																16,453	79,286	3,778	126,724
Leetonia	352,004																28,784	200,163	228,536	809,487
Leonard	297,011																	10,591	151,952	459,544
Lincoln	275,777																87,908	279,399	153,822	796,906
Longyear	16,778																22,788	81,004	221	121,391
Mahoning	1,011,661									117,884	167,245	519,892	520,751	750,341	911,021	765,872	1,038,645	1,009,446	706,325	7,519,083
Malta	139,853													28,615	65,346	126,299	222,640	11,675	66,641	661,069
Miller	118,520																			113,520
Minorca	117,653																35,499	115,886	121,739	390,777
Monroe	13,730																			13,730
Morris	1,070,937																			1,070,937
Morrow	60,725																35,571	49,409	33,012	178,717
Mtn. Iron	2,495,089							4,245	119,818	573,440	371,274	142,021	773,538	650,955	1,137,970	1,001,324	1,058,160	1,421,456	1,348,714	1,168,855	12,266,869
Myers	188,568																			188,568
Norman									38,999	93,392	77,523	101,077	110,141							421,132
Ohio										28,943	69,925	47,350	101,607	293,651	175,597					714,073
Pearce																				105,323
Penobscot												11,933	29,652	85,619	146,641	221,080	54,884	50,204	235	706,071
Pettit	140,239																209,531	1,615		257,311
Pillsbury	161,924																17,278	52,706	27,088	1,057,112
Roberts													99,691	106,487	101,032	120,723	238,122	229,133		190,554
Rust	272,114											18,614		57,847	41,965	42,786	28,972			272,114
Sauntry																				700,140
Scranton														53,004	68,560	328,739	249,837			1,168
Sellers	261,501									47,433	153,037		112,765	174,867	56,280	34,918	193,428	251,631	207,990	1,493,849
Sharon																56,810	224,526	48,199		329,535
Shenango	213,097																		51,712	264,809
Sparta	27,777											66,722	226,156	237,143	202,144	156,426	227,444	40,458	59,692	1,243,962
Spruce	606,295														101,675	279,515	543,203	587,153	589,319	2,707,160
St. Clair	61,792																	6,148	26,748	94,688
Stephens	367,764																	87,055		454,819
Stevenson	1,428,614														56,031		666,273	1,434,681	1,014,582	1,652,021	6,252,202
Tener	58,136																			58,136
Troy	87,584																	15,099	12,739	115,442
Union															8,297	93,109	103,522	91,496		286,424
Utica	185,944																9,099	156,180	120,697	471,830
Virginia (Oliver)	402,224														244,876	5,420	5,131	5,866	5,395	3,566,722
Webb	71,235							125,015	505,955	500,377	808,291	601,072	349,100							71,235
Williams (N. Cin'ti)																				44,890
Wills	4,550									3,046	11,249			12,357	18,238					16,708
Winnifred																	12,158			120,865
Yates	58,174																	39,179	81,686	111,553
Miscellaneous																			53,179	15,598
								13,858	2,140											
Total	20,153,699						4,245	613,620	1793,052	2,781,587	2,882,079	4,275,809	4,613,766	6,626,384	7,809,535	9,004,890	13,342,840	12,892,542	12,156,008	98,950,056
Vermillion Range.																				
Chandler	365,739		454,612	306,220	336,002	373,969	651,655	435,930	558,050	605,024	471,545	438,365	715,919	808,359	644,801	627,379	645,786	460,548	422,162	8,922,,65
Pioneer	653,682			3,144	12,012	3,079	2,651			40,054	149,073	207,103	123,183	339,897	450,794	678,310	673,863	596,735	505,432	4,439,012
Savoy	91,775													81,022	170,446	212,008	243,937	169,616	74,866	1,043,670
Sibley	251,170													5,169	4,670		78,304	113,595	122,783	575,691
Soudan (Minnesota)	205,002	986,256	57,341	535,318	532,000	517,570	498,353	370,303	390,463	432,760	448,707	592,196	426,040	457,732	325,020	208,284	275,168	175,114	70,713	7,904,340
Zenith	109,818						14,991	14,388			18,765	40,817		79,323	60,089	60,082	167,205	161,091	86,557	813,126
Total	1,677,186	986,256	511,953	844,682	880,014	894,618	1167,650	820,621	948,513	1,077,838	1,088,090	1,278,481	1,265,142	1,771,502	1,655,820	1,786,063	2,084,263	1,676,699	1,282,513	23,697,904
Gogebic Range.																				
Anvil	82,118	10,075	24,676	47,000	45,690	73	42,090		13,297	68,064	57,483			5,037		1,101	135,502	11,309	45,595	589,110
Ashland	409,131	256,319	174,183	257,915	435,949	267,439	231,896	66,067	83,020	126,096	91,149	111,625	123,208	154,615	232,961	286,399	301,824	274,138	344,102	4,228,036
Atlantic	208,039	1,369								70,989	60,727	50,307	38,058	19,964	135,955	190,135	190,213	148,385	77,224	1,191,365
Aurora		259,227	179,937	199,865	246,695	83,554	319,482	179,028	203,152	245,883	187,169	166,122	133,076	170,369	193,111	223,747	462,981	355,367	212,920	3,961,683
Brotherton	137,351	30,601	40,639	53,267	80,486	46,574	130,833	18,905	47,148	40,567	50,490	46,186	73,198	78,858	89,804	104,109	53,255	94,986	84,870	1,301,127
Cary (and Superior)	146,414	70,676	1,228	56,542	116,203	121,186	106,484	28,578	16,559	52,349	38,821	37,308	43,162	62,524	125,496	179,374	136,895	89,221	61,890	1,490,880
Chicago											504				633		44,625	22,965		38,747
Colby	83,736	601,274	285,880	136,833	193,038	9,619	69,968	59,346	32,616		48,492	22,921	152,875	103,239	32,572	23,475	22,526	54,915	81,141	2,014,466
Eureka					23,794	13,907	10,655	31,385	18,329	26,105	4,544									128,719
Geneva																		7,108		7,108
Harm'ny (G'rm'nia)	2,973	36,916	53,918	103,169	52,000	22,383	4,283	7,964				1,015		1,255	986	10,358	20,502	2,246	23,364	393,332
Hennepin	2,589		28,721	76,545	63,903	15,759									7,728	21,475	36,383	862		253,995
Iron Belt			30,000	51,551	110,368	1,506	161,635	23,976	45,109	148,228	81,351	96,763	58,418	105,934	54,064	43,883	79,121	25,353		1,117,869
Ironton	41,314	43,186		8,635	6,247	300								7,977	25,047		8,555	16,875	23,197	181,333
Jack Pot							3,944	1,651				1,265			33,893	19,988	102	31,709	6,538	99,090
Meteor (Comet)					2,882	10,144	54,779	9,604	11,782					332	7,844	34,140	19,117	6,156	59,587	216,367
Mikado	140,740									4,788		11,397		10,324	1,090	91,846	98,834	108,709	25,611	493,339
Montreal	107,854	67,002	38,015	116,094	143,691	108,684	73,409	34,299	46,037	138,882	131,531	191,106	270,776	153,307	107,524	72,945	136,354	93,139	163,021	2,193,670
Newport	438,023	95,844	69,145	36,987	71,488	105,606	165,962	109,718	150,392	157,821	142,369	150,979	196,953	263,711	217,201	190,448	141,571	279,965	171,931	3,156,054
Norrie Group	1,527,128	377,517	412,196	674,394	906,728	758,572	985,216	472,062	621,608	738,480	329,068	604,281	700,990	714,669	666,389	660,965	1,080,032	790,346	618,638	13,639,279
Ottawa (Odanah)	21,986	44,189	5,412	13,354	1,065		6,711	3,956	2,437								26,141	87,929	30,429	243,600
Pabst		38,988	49,976	116,376	172,060	130,226	113,245	104,510	206,074	219,960	68,984	220,496	223,891	263,869	239,242	198,686				2,366,583
Palms	13,953	1,414	9,725	35,245	50,604	32,227	102,382	2,658	37,911	46,965	114,108	207,153	175,925	154,705	139,658	7,603	32,113	60,800	53,718	1,278,867
Pence			26,687	574							13,185	120								40,566
Pike	11,161														3,434	6,346	6,343	115		27,399
Puritan (Ruby)		61,388	3,058	9,472	11,694	913										21,788			1,259	109,572
Shores											12,196	16,102	15,691	11,819						55,808
Sunday Lake	79,209	30,505			6,010	64,902	56,046	22,876	34,323	20,970	89,441	45,815		12,526	74,097	89,997	144,630	91,383	50,625	913,355
Tilden	188,104					28,415	233,356	135,118	209,077	418,188	250,205	276,890	287,203	500,830	481,909	446,670	468,672	211,534	204,581	4,340,752
Upson																	11,065	310		11,375
Windsor		27,322	1,313	14,576	37,210	97	53,242	2,474		11,438	28,154	385			488	84				177,540
Wisconsin (New Davis)	3,160				1,497		21,754	15,210		10,253				5,029	3,569		31,530	734	11,225	103,961
Yale (West Colby)	60,224															12,836	26,043	46,211	46,860	192,174
Miscellaneous		93,310	2,387		68,508	17,488	24,619		30,597	1,950							8,555	204		247,618
Total	3,705,207	2,197,122	1437,096	2008,394	2847,810	1839,574	2971,991	1329,385	1809,468	2,547,976	1,799,971	2,258,236	2,498,461	2,795,856	2,875,295	2,938,155	3,663,484	2,912,912	2,398,287	46,834,680
Miscellaneous — (In Wisconsin)																				
Iron Ridge	39,978	2,320																		
Illinois	71,413																	17,913	19,558	79,769
																			47,922	119,335
Total	111,391	2,320																17,913	67,480	199,104

TRADE REVIEW

IPMENTS (Gross Tons) FOR 1905 AND PREVIOUS YEARS.

TOTALS.	NAME OF MINE.	1905	Prior to 1888	1888	1889	1890	1891	1892	1893	1894	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	TOTALS.
	Menominee Range.																				
7,616,001	Alpha																				
215,684	Antoine	138,395									27,931	110,821	98,847	104,510	93,025	119,940	63,429	110,993	1,370 107,886	81,164	1,370 1,056,941
295,515	Appleton	1,819						4,377	5,618		2,107										
198,593	Aragon	423,698			1,745	46,609	96,829	167,948	127,901	138,209	183,296	95,809	149,594	256,821	337,807	404,645	477,212	646,203	522,035	374,944	13,921 4,490,305
504,227	Armenia				50,275	26,649					2,045						18,750	100,864	31,901	16,577	247,061
15,073	Baltic	133,246															17,326	64,664	123,236	151,114	489,586
2,143,028	Breen	16,625	17,430																		34,055
198,933	Bristol	210,388						57,352	9,612						80,915	51,639	36,593	129,035	246,581	132,420	984,535
6 601,843	Caspian	70,248																	2,088	4,242	16,578
1,860,452	Chapin	902,628	1,665,839	290,871	518,990	742,843	488,749	660,052	489,134	235,895	618,589	420,318	643,402	724,768	940,513	929,937	929,701	956,812	704,051	541,824	13,404,416
713,048	Columbia	27,883	43,715	10,936	11,385	60,133	70,770	57,682	22,426	10,300	70,867	87,202	24,623	14,199	126,290	97,531	19,963	186,798			942,703
139,261	Commonwealth	8,085	429,775	61,818	108,515	116,786	134,982	249,113	151,291	174,921	208,880	93,707	98,283	250,687	117,296	53,342	77,799	112,704	5,051	1,617	2,454,651
766,061	Crystal Falls	152,255	1,341			3,974					13,037	44,526	96,210	128,233	147,346	197,770	230,614	195,555	117,096	180,983	1,507,940
135,006	Cuff														20,210	38,209					58,419
1,528,892	Cundy											3,396	41,942	76,877	100,902	141,148	178,800	183,052	111,851		837,967
163,444	Delphic		33,718									52									33,770
16,987	Dober													5,009	10,980	49,203					65,192
936,033	Dunn	21,051	24,677	118,096	151,828	156,963	162,721	133,666	58,590	34,538	90,885	47,081	31,062	49,381	7,458			2,816	5,365		1,086,178
150,304	Florence	233,858	402,640	142,585	196,269	218,570	48,806	48,246	9,634	2,726	22,820	35,136	37,594	93,663	74,235	35,756	15,395	130,798	95,877	153,452	1,998,060
249,467	Forest																			11,988	11,988
601,512	Genesee	77,370																14,455	61,694	132,380	285,899
319,453	Great Western	191,295	89,628	21,860	38,454	72,546	62,464	87,487	661			14,643		33,851	43,316	98,550	123,261	42,470	100,751	68,318	1,089,525
1,186,091	Groveland						1,049										11,444	7,599	1,294	4,737	26,123
906,667	Hemlock	124,450					35,531	65,459	11,323		949	94,645	96,032	69,865	110,269	72,413	149,966	123,331	79,420	136,252	1,169,885
11,299,649	Hiawatha	9,704							1,683		1,201					11,008	20,355	74,596	53,828	38,288	210,663
185,065	Hilltop														3,496	6,410	2,503				12,409
1,554,508	Hope							15,543	2,275									3,373	7,339		28,530
133,094	Keel Ridge		59,465					5,997	3,248		19,441				4,900						93,101
2,697,209	Lamont (Monitor)	74,991			12,348	31,139	26,226	42,819	13,771	2,000					67,652	31,323		47,267	43,736	29,393	422,271
763,827	Lincoln	19,539					1,813	26,019	8,757						43,622	72,959	19,727	7,747	15,606	17,577	223,366
164,514	Loretto	118,738							8,131	35,983	53,160	34,334	54,104	68,447	64,824	61,219	54,985	128,300	87,939	54,720	844,884
414,922	Mansfield	38,584				18,393	49,839	69,259	69,558				37,182	60,739	86,607	90,155	74,113	31,181	51,440	79,163	756,120
284,437	Mastodon		142,410	51,463	63,511	66,526	45,370	9,150	23,485		23,733	60									425,708
273,884	Michigan Explo. Co.	58,098							506	77	1,071		216					53,272			113,229
158,484	Millie (Hewitt)		40,602	11,124	12,274	39,232	5,889	6,780		13,062	10,924	21,815	10,374	17,430	15,194	14,922	12,133	25,935	40,860		298,550
225,065	Monongahela																2,397				9,310
128,886	Munro	92,183																	8,739	32,332	133,254
621,283	Nanaimo	91,238	105,181	5,744		3,441	13,200											1,324	17,280		35,810
127,738	Northwestern		17,206															10,383	9,863	9,086	227,890
287,202	Paint River	11,973	50,686	12,506	32,700	62,654	45,435	18,390								1,316				11,257	267,163
4,962,469	Penn Iron M'ng Co.	423,244							280,450	175,274	280,622	179,917	237,886	223,713	229,651	197,606	358,126	10,383	9,863	11,257	3,555,423
355,697	Pewabic	533,413							165,745	304,010	262,551	273,587	279,855	305,072	530,129	374,043	507,786	273,443	343,543	141,948	5,135,219
126,724	Quinnesec		281,074	2,249							761				11,050	25,967	66,383	530,291	489,175	372,791	499,756
899,487	Riverton	82,611				26,991	64,507	115,273							2,262	71,004	119,860	62,531	49,708	33	670,763
459,544	Sheridan																	215,850	97,633	81,543	116,299
796,906	Tobin				1,102	595	7,137	45,745	2,234		16,754	3,419	146		31,104	8,083					399,779
121,391	Verona	166,529															18,957	55,238	45,386	113,669	130,975
7,519,083	Vivian															5,143	11,475	43,245	50,910	20,202	224,286
661,069	Youngs	90,426																40,384	12,122	81,354	10,296
113,520	Youngstown	10,926																			151,425
380,777	Miscellaneous		89,887	12,699		44,460	3,705				13		661								6,482,220
13,730			4,654,722	449,150	597,358	543,823	459,600	375,142	109	354	2,161										
1,070,937	Total	4,495,451	7,549,797	1191,101	1796,754	2282,237	1824,619	2261,499	1466,197	1137,949	1,923,798	1,560,467	1,937,013	2, 522,265	3,301,052	3,261,221	3,619,053	4,612,509	3,749,567	3,074,848	53,867,397
178,717	**Marquette Range.**																				
2,266,869	Bessie	21,879					847											5,007	29,718		57,451
188,568	Beaufort	38,306	90,217													1,583	4,338	59,781	134,648	25,781	354,654
421,132	Blue								13,809	32,171	44,140		2,519								92,639
714,073	Boston		61,955									587									62,542
105,323	Breitung																				17,723
706,071	Cambria	81,791	378,209	57,861	72,780	80,359	34,662	41,549	30,445	47,218	41,656	95,086	110,648	102,623	124,930	80,432	68,907	63,976	7,854	9,899	1,639,152
237,311	Champion	64,680	1,907,894	174,680	215,098	223,442	135,413	109,979	61,648	42,788	100,398	113,375	141,728	163,190	215,074	113,743	99,026	205,721	41,168	84,852	4,160,289
1,057,112	Chester	28,766	234,223	402									3,975			22,585	22,815	24,874	74,238	174	339,426
180,154	Cleve'd-Cliffs Gr'p	1,288,416	3,704,954	184,316	274,048	331,713	221,788	310,907	218,105	143,706	221,153	513,119	718,408	869,482	1,011,048	881,021	860,484	1,104,864	6,786		14,411,640
272,114	Dexter		21,839	1,821	3,895	9,136	5,448	13,000	7,833	21,740	13,752	18,903	1,154						810,845	743,263	118,512
700,110	East New York	33,095		13,694	29,739	36,431	50,293	35,175	911									27,987	31,696	38,761	22,523
1,168	Foxdale	3,933																			7,299
1,493,849	G'd Rapids (Davis)																		4,647	15,015	5,053
329,535	Hartford	322,209	1,200	11,611	20,038	26,426	9,362	22,823	352	12,973	6,764	67									3,429
264,899	Humboldt				566			5,678	6,513			1,532									31,447
1,243,952	Imperial		646,434	11,655	15,866	23,259	19,879	4,571				2,297						7,440	20,085	179,980	110,730
2,707,160	Jackson	1,661				38,460	18,552	7,194							21,235	62,321					544,003
94,688	Lake Angeline	33,180	2,714,454	101,909	128,891	124,682	92,979	92,567	51,089	32,298	42,186	80,710	79,102	55,012	88,230	31,714	38,271	15,449	5,409		723,961
6,252,202	Lake Superior	727,378	4,195,131	240,225	288,784	318,321	308,831	366,715	328,610	344,758	342,439	459,576	376,761	686,563	682,595	709,143	635,642	832,796	604,829	590,359	152,150
58,136	Lillie	9,868	144,550	32,692	33,916	31,812	19,551	29,005	68,861	78,388	54,285	107,532	112,781	211,023	196,200	114,990	98,788	79,919	77,454	63,209	13,040,436
115,442	Lucy (McComber)		319,566	22,276	32,982	43,483	27,683	26,326	21,964				10,033	11,846							1,564,824
286,424	Mary Charlotte	221,738																	34,303	48,885	516,159
471,830	Mesabi's Friend										5,503	10,540									304,926
3,556,722	Moore															4,648	37,655			25,828	16,043
71,275	Negaunee	239,554	5,259	45,304	78,318	76,488	64,218	85,846	69,732	132,581	90,682	175,394	182,169	191,330	195,573	126,829	234,713	204,286	224,665	145,132	68,131
44,890	New York (York)		1,040,129		12,844	2,422		11,220	25,000	21,487					6,642	3,327					2,568,073
16,708	Ogden												986								1,125,071
120,865	Platt																				986
111,353	Princeton (Sw'nz'y)	129,079	154,696				7,301	2,676	5,448	41,226	13,198	11, 296									73,844
15,998	Palmer							29,403	19,096		6,593			25,247	55,802	75,037	67,051	118,048	84,223	76,461	348,037
	Primrose											1.041									1,041
8,950,056	Queen	253,377	40,510	61,034	186,400	388,479	479,509	379,719	106,864	220,298	160,817	6,040									6,040
	Republic	150,629	2,805,450	255,062	287,390	220,065	191,127	167,591	64,195	105,719	174,027	323,057	239,774	61,022	342,978	398,298	400,845	418,044	254,658	311,479	5,027,162
8,922,465	Richmond	86,129										127,360	124,342	140,312	137,085	130,126	104,604	157,646	155,415	124,506	5,603,121
4,439,012	Richards		1,374									1,088	4,630	24,464	4,613	51,303	54,181	50,041	55,593	68,134	400,176
1,043,670	Star West (Wheat)		82,052	4,987	7,997	15,141	4,412			5,550	51,207	9,658	6,887 942		6,716	15,987					8,261
575,691	Volunteer	106,281	412,946	56,329	60,156	141,524	92,699	127,130	69,561	26,946	32,672	53,216	1,617		29,983	47,578		32,736	7,395	71,870	204,649
7,904,340	Webster		13,690		448											20,797					1,370,631
813,126	Winthrop					109,576	122,042	191,658	189,071	134,365	119,120	150,496	106,894	122,592	171,318	148,945	109	129,496	72,433		34,905
	Miscellaneous		5,136,784	444,277	663,567	490,764	366,041	316,520	134,580	240,565	263,691										1,759 115
3,697,904	Total	4,210,522	25,201,583	1923,727	2642,813	2993,664	2512,242	2665,169	1837,580	2059,330	2,097,838	2,604,221	2,715,035	3,125,033	3,757,010	3,457,522	3,245,346	3,868,025	3,040,245	2,843,703	8 076,789
589,110																					76,800,614
4,228,036	GRAND TOTAL	34,353,456	35,937,078	5063,877	7 292643	9003,725	7071,053	9070,554	6067,403	7748,312	10,429,037	9,934,828	12,464,574	14,024,673	18,251,804	19,059,393	20.593.507	27,571,121	24,289,878	21,822,839	300,049,755
1,191,365																					
3,961,683																					
1,301,127																					
1,490,880																					
38,727																					
2,014,466																					
128,719																					
7,108																					
393,332																					
253,965																					
1,117,569																					
181,333																					
99,090																					
216,367																					
493,339																					
2,193,670																					
3,156,054																					
3,639,279																					
243,600																					
2,366,583																					
278,867																					
40,566																					
27,399																					
109,572																					
55,808																					
913,355																					
3,340,752																					
11,375																					
177,540																					
103,961																					
192,174																					
247,618																					
1,834,680																					
79,769																					
119,335																					
199,104																					

MINES NOT PRODUCING SINCE 1895.

MARQUETTE RANGE.

American (Sterling)	112,933
Ames	6,298
Barnum (Iron Cliffs)	801,851
Bay State	16,637
Braastad (Mitchell)	136,636
Braastad (Winthrop)	831,445
Chicago	9,012
Columbia (Klomin)	94,813
Curry	16,671
Detroit	140,841
Dey	2,709
East Champion	76,002
Edison	893
Erie	8,136
Etna	1,091
Fitch	31,817
Foster	171,893
Gibson	16,357
Goodrich	49,754
Hortense (Champion)	30,554
Iron Cliffs	1,700,537
Iron Mountain	393
Manganese	6,359
Marquette	152,907
Michigamme	880,362
Milwaukee	375,451
National	150,216
Negaunee Con. Wks.	12,708
N. Republic	289
N. Y. Hematite	37,587
Northwest	1,687
Nonpareil	23,395
Norwood	5,753
Pascoe	59,806
Pendill	45,993
Phenix	59,114
Pioneer	15,409
Quartz	491
Republic Reduction Co.	47,174
Riverside	16,160
Saginaw	431,424
Salisbury (Iron Cliffs)	686,411
Sam Mitchell	17,780
Samson (Argyle)	267,805
Schadt	1,261
Section 12	21,887
Spurr	164,244
Taylor	32,970
Titan	90,371
West Republic	133,077
Wetmore	50,870
Wheeling	10,555
Total	8,076,789

MENOMINEE RANGE.

Beta	4,211
Brier Hill	14,981
Calumet	38,713
Cornell	49,302
Curry	416,928
Cyclops	286,093
Emmett	66,655
Fairbank	8,500
Half and Half	7,524
Hamilton	96,072
Hersel	955
Hollister	4,098
Indiana	17,871
Iron River (Riverton)	904,587
Lee Peck	2,844
Ludington	1,001,518
Manganate	6,844
Metropolitan	107,027
Norway	1,291,352
Perkins	397,225
Perry	3,138
Selden	2,092
South Mastodon	8,203
Stephenson	39,350
Sturgeon River	18,404
Vulcan	1,668,644
Walpole	19,089
Total	6,482,220

GOGEBIC RANGE.

Bessemer	20,889
Blue Jacket	1,799
Federal	36,443
First National	1,997
Iron Chief	12,199
Iron Chief No. 2	551
Sparta	4,862
Superior	121,627
Trimble	25,931
Tyler's Forks	10,683
Valley	1,878
Total	238,859

MESABI RANGE.

Minnewas	15,998